PART 2
DECISION SUMMARY

11.0 PRINCIPAL THREAT WASTE

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained and/or would present a significant risk to human health or the environment should exposure occur.[14] Principal threat materials in the Coeur d'Alene Basin may include, for example, metal concentrates spilled during mill operations or in transport to smelters. A time-critical removal action was conducted in 1999 to address all known surface concentrates associated with rail transport along the Wallace-Mullen Branch of the UPRR. If additional concentrates or other materials that meet the definition of principal threat waste are encountered during remedy implementation, these materials would be managed in a manner that is protective of human health and the environment and consistent with the NCP.[15] The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP§300.430(a)(1)(iii)(A)). Where EPA determines that it is not practicable to use treatment to address principal threat waste, such waste may be transported off-site, consistent with the Off-Site Disposal Rule, 40 CFR 300.440, or managed safely on-site, consistent with all ARARs identified in Section 13.2 of this ROD.

[14] Additional information for defining principal threat wastes can be found in USEPA (1991b) "A Guide to Principal Threat and Low Level Threat Wastes."

[15] Concentrations used to identify principal threat waste within the Bunker Hill Box were: 127,000 ppm antimony; 15,000 ppm arsenic; 71,000 ppm cadmium; 84,600 ppm lead; 33,000 ppm mercury (Source: Bunker Hill Non-Populated Areas ROD, ROD ID: EPA/ROD/R10-92/041, Date: 09/22/1992). Additional factors (e.g., mobility, repository waste acceptance criteria, etc.) should be evaluated on a site-specific basis prior to disposal of material associated with implementing the Selected Remedy.

12.0 SELECTED REMEDY

This section presents the rationale, description, estimated costs, and expected outcomes of the Selected Remedy, which includes interim measures. The Selected Remedy is identified in Table 12.0-1.[16] The Selected Remedy in accordance with 40 CFR 300.430(a)(i)(B) includes final remedial actions for human health in the community and residential areas, including identified recreational areas, of the Basin upstream of Coeur d'Alene Lake (the Upper Basin and Lower Basin) as well as final remedial actions for all of the human health remedy upstream of Upriver Dam and all of the environmental remedy from the Idaho/Washington border to Upriver Dam. The remedial action selected by this ROD for environmental protection in the Upper Basin and Lower Basin will neither be inconsistent with nor preclude implementation of the final remedy which will be identified in subsequent decision documents. The remedy selected by EPA was developed through comprehensive discussions among EPA, states, tribes, federal trustees, and the public, including the Idaho-led Consensus-Building Process.

State legislation under the Basin Environmental Improvement Act established the process for the formation of the Basin Environmental Improvement Project Commission. This commission includes federal, state, tribal, and local governmental involvement. EPA anticipates working as a member of this commission for implementation of the ROD and development of priorities and sequencing of cleanup activities.

The Selected Remedy is described in four parts:

Section 12.1: Protection of Human Health in the Community and Residential Areas of the Upper Basin and the Lower Basin

The Selected Remedy includes all of the remedy for protection of human health in the community and residential areas, including identified recreational areas. No further actions for protection of human health in community and residential areas are anticipated. Certain potential exposures outside of the community and residential areas of the Upper Basin and Lower Basin are not addressed by this ROD, and will continue to present risks of human exposure to hazardous substances. These potential exposures impacting human health include:

[16] The estimated costs in this table and in subsequent detailed cost estimate tables are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost, consistent with RI/FS guidance.

- Recreational use at areas in the Upper Basin and Lower Basin where cleanup actions are not implemented pursuant to this ROD
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribes

- Potential future use of groundwater that is presently contaminated with metals

Section 12.2: Environmental Protection in the Upper Basin and Lower Basin

For environmental protection, an adaptive management strategy has been adopted for the Upper Basin and the Lower Basin. The Selected Remedy consists of approximately 30 years of prioritized actions designed to achieve benchmarks for environmental protection. These actions will be implemented concurrently with the human health actions.

The Selected Remedy includes benchmarks for ecological protection; however, the long-term goals are to provide full protection of the environment as well as to return the opportunity for individuals to practice subsistence lifestyles without limits from mining contamination. During the five-year review process and at the end of this approximately 30-year period, EPA will evaluate and decide whether any additional remedial actions under CERCLA are necessary to attain ARARs and to provide for the protection of human health and the environment, and whether any ARAR waivers should be applied.

Section 12.3: Coeur d'Alene Lake

The Selected Remedy does not include remedial actions for Coeur d'Alene Lake. State, tribal, federal, and local governments are currently in the process of implementing a Lake Management Plan outside of the Superfund process using separate legal authorities.

Section 12.4: Spokane River

The beaches and wading areas adjacent to the Idaho portion of the Spokane River were sampled in 1998 and were found to be safe; i.e., concentrations of metals did not exceed risk-based levels for recreation. The Selected Remedy for the Spokane River includes all of the human health remedy upstream of Upriver Dam and all of the environmental remedy from the Idaho/Washington border to Upriver Dam. Additional sampling is included in the Selected Remedy to determine the need to address areas upstream of the state line for environmental protection and downstream of Upriver Dam for human health and environmental protection. Quantification of risks to persons, including Spokane tribal members, and others who may practice a subsistence lifestyle in the Spokane River area, was not part of the RI/FS investigations. EPA and the Spokane Tribe are cooperating in planning additional testing and studies that will be implemented to evaluate the potential exposures to subsistence users. The

results of those tests and studies will determine appropriate future response actions to be taken, if any.

Management of materials generated by cleanup activities is described in Section 12.5, and monitoring is described in Section 12.6.

The cleanup actions selected in this ROD will be sequenced during the approximately 30 years of cleanup. Some of the considerations for the sequencing of the cleanup include the following:

- Cleanup of community and residential areas, including the identified recreational areas, to minimize human health exposure is a top priority. Input from local community residents will be considered as the remedy is implemented. It is anticipated that cleanup of these areas will be conducted concurrently with the ecological remedy.

- Some cleanup actions related to ecological protection will require additional information to fill data needs prior to initiating the cleanup.

- Downstream areas subject to recontamination will generally be cleaned up after upstream sources of contamination have been stabilized; however, cleanup in some downstream areas will be conducted prior to completion of upstream source stabilization. Examples include river bank stabilization and waterfowl feeding areas with high use and relatively low recontamination potential.

- The level of funding available will influence the rate and extent of cleanup actions.

- The sequencing of remedial actions will consider the need to limit short-term impacts to the communities and provide certainty to communities for commerce and economic stability.

As the Selected Remedy is implemented, additional information will become available, and the specific actions taken could differ from those currently envisioned, based on this additional information. If changes to the remedy are selected, the changes can be documented in one of three ways. Examples of the changes and documentation requirements are given on page 6-58 of the EPA guidance document (USEPA 1999a).

- Non-significant or minor changes will be documented in the site file. Depending on the nature of the change, EPA may also prepare a fact sheet for public distribution. Non-significant or minor changes do not undergo formal public review and comment.

- Significant changes will be documented in an ESD. A notification and description of the ESD will be published in major local newspapers. The ESD will be made available to the public by placing it in the Administrative Record file and information repository. Although not required, EPA may elect to hold an additional public comment period or public meeting on the planned ESD.

- Fundamental changes will be documented in a ROD Amendment. A revised Proposed Plan will be published that highlights the proposed changes. The portion of the ROD being amended will be evaluated using the nine CERCLA evaluation criteria. EPA will conduct the public participation and documentation procedures specified in the NCP. The final decision to amend is not made until after consideration of public comment.

The following sections describe the Selected Remedy for protection of human health and the environment in the Coeur d'Alene Basin.

12.1 HUMAN HEALTH PROTECTION IN THE COMMUNITY AND RESIDENTIAL AREAS OF THE UPPER BASIN AND THE LOWER BASIN

Exposures to lead in soil and dust from the home, surrounding communities, and recreational areas are the primary human health concerns in the affected communities in the Basin. In particular, preventing excessive lead exposures in young children and pregnant women is a top priority. Table 12.1-1 shows the estimated number of residences in the Basin with lead concentrations in yard soil that require remediation. Additional human health concerns include arsenic in residential soils, lead in fish from the lateral lakes, and metals such as cadmium, arsenic, and lead in shallow drinking water wells in the side gulches and main valley of the Upper Basin and floodplain areas of the Lower Basin.

EPA has selected a remedy for protection of human health in the community and residential areas that consists of the following elements, which are summarized in Table 12.1-2:

- Soil and house dust: Alternatives S4 (Information and Intervention and Partial Removal and Barriers) and D3 (Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Contingency Capping/More Extensive Cleaning)

- Drinking water: Alternative W6 (Public Information and Multiple Alternative Sources)

- Aquatic food sources: Alternative F3 (Information and Intervention and Monitoring)

The Selected Remedy is the complete human health remedy in the community and residential areas, including identified recreational areas. This remedy also was the Preferred Alternative in the Proposed Plan. It is the most appropriate remedy because:

- The remedy satisfies the CERCLA threshold criteria and provides the best balance of tradeoffs with respect to the CERCLA balancing and modifying criteria

- The remedy satisfies the statutory requirements outlined in CERCLA §121

12.1.1 Description of the Selected Remedy

This section describes the Selected Remedy for soil and house dust, drinking water, and aquatic food sources, including institutional controls.

Soil and House Dust

Young children are primarily exposed to lead in dust on the floors of their homes (CDC 1991, Manton et al. 2000, Succop et al. 1998, Lanphear et al. 1998). Lead in house dust reflects contaminated soil from the yard, neighborhood, and surrounding community (IDHW 2001a, IDHWDG 1999). Preventative actions include source removal and containment inside and outside the home. Remedies that do not include source removal and containment would not adequately prevent exposure. A long-term basin-wide institutional controls program, as well as actions to prevent recontamination, will be implemented to maintain the integrity of the human health remedy.

The Selected Remedy, which is consistent with the remedy developed by the State of Idaho, incorporates experience from successful cleanup actions within the Bunker Hill Box. For example, removal of contaminated yard soil has been shown to be effective in reducing house dust concentrations in the Box for a large number of homes. Figure 12.1-1 shows Smelterville soil and dust lead geometric means for the years 1990 to 2001 in homes with children participating in the LHIP.

Soil Action Levels. As described in Section 7.0 of this ROD, the Box model was used to develop the action level for lead in soil, which was established to reduce exposure pathways so that a typical child would have a 5 percent or less probability of a blood lead level greater than 10 µg/dL and a 1 percent or less probability of a blood lead level greater than 15 µg/dL. A tiered approach to lead soil cleanup levels was developed based on the results of the model. The Box

model supported a soil remediation level for lead starting at approximately 700 mg/kg. Therefore, for soil with lead concentrations between 700 mg/kg and 1,000 mg/kg, a barrier (such as vegetation) will be required to prevent direct exposure to soil and migration of soil to dust in homes. For soil with lead concentrations above 1,000 mg/kg, partial removal and a soil barrier will be required. This tiered approach was developed after considering a number of factors, such as protectiveness, implementability, cost-effectiveness, and community acceptance.

Section 7 of this ROD also evaluated human health risks from arsenic in residential soils. A number of factors were considered to select a soil arsenic cleanup level for this site, including the nature and extent of site contamination, the nature of human health risks, the exposure pathways, and the potential impacts and costs associated with physical remediation activities in the community. A range of arsenic soil concentrations from 64 mg/kg (1 in 10,000 cancer risk) to 123 mg/kg (non-cancer risk) was identified as protective of human health based on a residential soil ingestion and dermal exposure scenario. EPA selected an arsenic soil cleanup level of 100 mg/kg, which is within the acceptable human health risk range and represents a balancing of factors for an arsenic soil remediation level at which engineering actions (e.g., soil removal) should begin at this site. It is estimated that a small percentage of residential yards in the Basin have arsenic soil concentrations above 100 mg/kg that are not co-located with lead above 700 mg/kg. Recreational areas with arsenic levels in excess of 100 mg/kg will be prioritized for cleanup based on use.

In addition, Section 7 also discussed cadmium concentrations in some homegrown vegetables that exceed target health goals. Since lead and cadmium are co-located in garden soil, the Selected Remedy will address risks associated with cadmium levels in homegrown vegetables through the cleanup of lead-contaminated garden soil.

Remedy Components. The Selected Remedy for soil and house dust is composed of the following components:

- Sampling
- Remediation of residential yards
- Remediation of street rights-of-way
- Remediation of commercial properties and common use areas
- Remediation of recreational areas
- Dust suppression during remedial activities

- Disposal of contaminated materials
- Health intervention program
- Remediation of interior house dust, if necessary
- Relocation, if necessary

Sampling. Prior to initiating remedial actions on a specific property, soil sampling will be completed. House dust sampling will be initiated for homes with young children or pregnant women in residence (as part of the health intervention services described in this section). Soil sampling will be conducted in accordance with established sampling procedures for the site, and will occur on a yard-by-yard basis. Property owners in the Basin will be able to request soil sampling and the results will be made available to them in a timely manner. Only those properties with soil sampling results above the soil action levels will require remediation.

Residential Yards. Yard soil with lead concentrations between 700 mg/kg and 1,000 mg/kg will require a barrier, such as vegetation, that will need to be continuous and sustainable with no bare soil exposed. The barrier will also need to reduce direct exposure to contaminated soil and migration of soil to dust in homes. In general, yard soil with lead concentrations greater than 1,000 mg/kg or arsenic concentrations greater than 100 mg/kg will be removed to a depth of one foot and backfilled with clean soils. For those yards with contamination at depth, a visual marker will be placed prior to backfilling. In contaminated garden areas, clean soil will be provided to a depth of two feet.

For each residential yard, the exact nature of the remediation (e.g., depth of excavation, which bushes to remove) will be considered on a case-by-case basis. However, for consistency, the following areas will generally be remediated within each yard:

- Sod areas
- Road shoulders (if curb and gutter are not present) to asphalt or pavement and to the lateral extension of property lines
- Alleys (if unpaved) to the extension of the lot lines
- Landscaped areas
- Garden areas
- Unpaved driveways

- Play areas
- Garages with dirt floors
- Storage areas

During the excavation process, all existing sod and soil coverings will be removed and disposed of along with the soil. Larger trees and shrubs generally will be left in place. After soil removal and backfilling, the yard will be revegetated. Lawn areas of remediated yards will generally be revegetated with sod. Steep hillsides not currently planted with vegetation will be stabilized and hydroseeded with native grasses. To the extent practicable, all yard landscaping will be returned to its original condition. The maintenance of barriers will be the responsibility of the property owners.

The cleanup of residential yards includes drainage improvements to ensure that contaminated material from areas yet to be cleaned is not transported to remediated areas. These drainage improvements will improve the long-term protectiveness of the partial removals.

Where appropriate, the exteriors of structures will be pressure-washed before remedial measures are performed to reduce the potential for recontamination from lead-based paint. This will be coordinated with the Department of Housing and Urban Development paint abatement programs. Programs for paint abatement and stabilization will be coordinated with the soil cleanup and sequenced to mitigate exposures as quickly as possible while limiting the possibility of recontamination.

Street Rights-of-Way. All ROWs within the Site will be managed to minimize exposure and contaminant migration. The remedial action determinations for ROWs will be based on location, use, and contaminant concentrations. In general, all contaminated ROWs will be addressed by a combination of access controls, capping (barriers consistent with land use), or removal/replacement. ROWs include all state, county, local, and private roads.

Commercial Properties and Common Use Areas. Commercial properties and common use areas include public buildings, parks, playgrounds, churches, and commercial buildings. Risks posed by commercial properties and common use areas are similar to those in residential settings; therefore, the cleanup actions for these properties will be similar to those proposed for residential yards. A combination of removals, barriers, and access restrictions will be used at commercial properties and common use areas based on location, use, and contaminant concentrations. Barriers will include vegetation, a minimum of six inches of clean soils or gravel, or a paved surface. Final decisions regarding barrier performance standards will be developed during remedial design or as a component of the institutional controls program.

Commercial properties used predominantly by sensitive populations will require a 12-inch soil barrier.

Recreational Areas. Formal recreational areas such as boat ramps, picnic areas, and campgrounds with surface soil containing lead concentrations greater than 700 mg/kg will be capped. Recreational areas with arsenic levels above 100 mg/kg will be prioritized for cleanup based on use. Vegetative barriers will not be used at formal recreational areas due to maintenance concerns related to the high traffic and use of these areas. Soils in recreational areas also may be excavated, if appropriate. Figure 12.1-2 shows the locations of the 31 recreational areas in the Lower Basin that have been prioritized for cleanup. Other recreational areas may be evaluated for cleanup based on factors such as risk of exposure, location, and use.

It is important to note that there are other areas identified in this ROD, specifically mine and mill sites in the Upper Basin and recreational areas along the Spokane River in Washington State, that include cleanup activities to protect human health. These areas and the estimated costs associated with their cleanup activities are summarized in Sections 12.2 and 12.4, respectively.

Dust Suppression for Remedial Activities. Dust suppression measures will be implemented throughout the remediation process to reduce exposure of workers and residents to airborne contaminants. Dust suppression will include, but not be limited to:

- Watering of residential yard areas prior to excavation activities
- Watering during excavation, as necessary
- Placement of tarps or covers over excavated materials
- Use of tarps or covers over truck beds to reduce blowing dust and spillage during transportation to the waste repository
- Daily cleanup of all spilled or tracked soils from sidewalks, roadways, etc.

Disposal of Contaminated Materials. Contaminated materials will generally be disposed of in repositories located within the Basin. A process for evaluating repository locations and design requirements is described in Section 12.5 of this ROD. EPA and the State of Idaho will work with affected citizens and other Basin stakeholders in the development and selection of repository locations.

Health Intervention Program. The Selected Remedy will include a lead health intervention program similar to the Bunker Hill Box LHIP, which provides personal health and hygiene information and vacuum cleaner loans to help mitigate exposure to contaminants. The

intervention program will include monitoring dust levels and lead concentrations in homes with young children or pregnant women during implementation of the Selected Remedy. The monitoring data will be used to direct nurse visits before lead exposure and blood lead concentrations peak in the late summer. This targeted education effort will be an added measure to mitigate exposure while the cleanup process is ongoing. The decision process for evaluating homes that will require intervention activities is described in Figure 12.1-3. The process is based on dust mat monitoring results, and includes consideration of the rate of dust entering homes (dust loading rate g/m^2/day) and the concentration of lead in the dust entering the homes (mg/kg). The HHRA identified lead loading rates as a strong predictor of blood lead levels. Along with age, lead loading rates accounted for 50 percent of the variability in blood lead levels observed in the Basin. The lead loading rate is the product of the dust loading rate and the dust lead concentration. Considering both dust loading rate and dust lead concentration provides more information than using lead loading rates alone.

The LHIP also provides a voluntary, annual blood-lead screening program that is funded by ATSDR. The results of the annual screening are evaluated to identify and serve children with elevated blood lead levels. The results of the blood lead screening program indicate that average blood lead levels, and the percentage of children in the Basin with elevated blood leads, have remained fairly stable from 1996 through 2000 despite varying participation rates. In 2001, the screening results showed declines in both the average blood lead levels and the percentage of children with elevated blood lead levels. It is important to note that only about 2 percent to 25 percent of eligible children, depending on the year, have been tested annually in the Basin over the last 5 years. This compares to more than 50 percent of eligible children who have been tested in the Box since 1988. More than 4,000 children in the Box have participated in blood lead surveys since 1988, compared to approximately 420 children in the Basin since 1996. Blood lead screening will continue to be offered to identify and treat families with excessive lead exposures, and it is hoped that annual participation rates will increase. The results of the blood lead screening program are shown by year on Tables 12.1-3 through 12.1-8 for 1996 – 2001 and summarized for all years on Table 12.1-9.

Interior House Dust. It is expected that soil remediation, including covers of one foot of clean soil or barriers, will substantially reduce lead concentrations inside each home. However, once yard cleanups are completed and lead soil concentrations have been reduced at all contaminated properties, it is possible that some homes will have dust lead levels requiring interior cleaning. For these homes, a contingency of interior cleaning and paint abatement (available via a state program) will be available (FS Alternative D3). Several factors will be considered to determine if interior house dust cleaning is required, such as an evaluation of the concentration of lead in the dust entering homes (dust lead concentrations), the amount of dust entering homes (dust loading rate g/m^2/day), and lead loading rates. Currently, these measurements are based on dust mat monitoring results. As previously mentioned, the lead loading rate is the product of the dust loading rate and the dust lead concentration. Cost estimates for dust abatement of these homes

are based on the Smelterville house cleaning pilot study (IDEQ 2001). The unit costs are expected to decrease if a lower level of cleaning proves to be effective, and as a result of the economy of scale of cleaning a larger number of homes.

Relocation. Relocation is proposed as a last resort for homes with contamination above action levels, where extensive recontamination is likely, or where adequate cleanup would be extremely difficult. For the vast majority of homes that fall above the action level, every effort will be made to find a way to ensure that the preferred soil alternative is effective in the long term. The governments will work with individual families and property owners to find the best solution.

Drinking Water

Prior to initiating drinking water response actions, drinking water sampling will be completed for homes on private wells. Basin property owners on private wells will be able to request drinking water sampling, and the results will be made available to them in a timely manner. To reduce current exposure to metals in drinking water, an alternate water supply will be provided to residences or areas where the existing water supply contains metals at concentrations greater than the drinking water standards shown in Table 8.1-2. Residences with affected private wells within water districts will be connected to the existing public water supply system. For residences outside of water districts (mostly in the tributary gulches), the alternate water supply will most likely consist of point-of-use treatment or new groundwater wells installed into a suitable aquifer. The estimated numbers of residences with drinking water containing metals at concentrations exceeding one or more MCL are shown in Table 12.1-10.

Actions for protection of groundwater and potential future drinking water supplies are not addressed as part of the Selected Remedy.

Aquatic Food Sources

The potential for lead exposure by consumption of fish and other aquatic food sources (e.g., water potatoes) will be managed through educational resources available to fishermen and other recreational users and health advisories for subsistence fishing. The educational resources and advisories will be issued by the IDHW and include information about the potential health risk of consuming contaminated fish caught from lateral lakes. IDHW and ATSDR will review the levels of metals in aquatic food sources to determine if education or consumption advisories are warranted. A fish consumption advisory already exists in the Lower Basin and along part of the Spokane River. The Selected Remedy also includes monitoring of metals in fish tissue from fish caught in Coeur d'Alene Lake to determine if fish are safe to eat by simulating tribal and recreational fish consumption. Reductions in the levels of metals in fish are expected to occur as a result of implementation of the ecological remedies but may not be sufficient to adequately reduce human health risks in the short term.

Institutional Controls

Institutional controls will be required to limit future exposures to contaminated soil that is left in place and groundwater not addressed by the Selected Remedy. It is anticipated that the existing Institutional Controls Program (ICP) in the Box will be used as a model for the Basin. The ICP includes records maintenance, permitting, surveillance, inspections, and local construction regulations developed and implemented in conjunction with local zoning, building, or planning commissions. For drinking water, expansion of the Bunker Hill "area of drilling concern" will advise drillers of the nonpotable nature of contaminated aquifers. For commercial and residential development, permitting will ensure that a local entity could evaluate the area for development and require standardized measures to prevent exposure to contaminants.

Implementation of the Selected Remedy

As implementation of the human health remedy moves forward, EPA and the State of Idaho, along with other stakeholders, will continue to work together to develop innovative and common sense approaches that meet the remedial action objectives. For example, the State of Idaho has developed a pilot program that will: (1) conduct a review of potential residential lead exposures (including interior and exterior lead sources), (2) develop remedial plans tailored to specific residential conditions, (3) increase involvement of homeowners in the remediation of their yards, and (4) create business opportunities for local contractors and workers. The first step will be to coordinate with property owners to request access for sampling of residential properties to better assess the need and locations for residential remedial actions. EPA is supportive of cleanup approaches that increase community support and participation while also meeting the goals of protection of human health and the environment. EPA and the State of Idaho will continue to work together to ensure that these shared goals are met during implementation of the Selected Remedy.

12.1.2 Estimated Remedy Costs

The estimated remedy costs are summarized in the following tables:

- Tables 12.1-11 through 12.1-14: Summaries of Estimated Costs for Soil and House Dust. The total estimated present worth cost for the Selected Remedy for soil and house dust, including yards, infrastructure, repositories, rights-of-way, commercial properties, and recreation areas, is $89,000,000. The net present worth of 30 years of operation and maintenance (O&M) is $920,000.

    - The total estimated present worth cost includes $21,000,000 for vegetative barriers and partial soil removals, $1,400,000 for information and intervention, $970,000 for drainage improvements, $3,200,000 for potential

recontamination, $2,700,000 for repositories, $2,100,000 for mobilization, $2,300,000 for administration, and $10,000,000 for contingencies. The estimated present worth O&M cost for repositories is $200,000. The total estimated present worth cost for cleanup of residential soils is $44,000,000.

- The total estimated present worth cost for street rights-of-way, commercial properties, and common areas is $35,000,000. The estimated present worth O&M cost is $0.

- The total estimated present worth cost for recreation areas is $5,900,000. The estimated present worth O&M cost for recreational areas is $720,000.

- The total estimated present worth cost for house dust programs is $4,300,000. The estimated present worth O&M cost of the house dust programs is $0.

- Table 12.1-15: Summary of Estimated Costs for Drinking Water. The total estimated present worth cost for the Selected Remedy for drinking water is $2,200,000. The net present worth of 30 years of O&M is $100,000.

- Table 12.1-16: Summary of Estimated Costs for Aquatic Food Sources. The total estimated present worth cost for the Selected Remedy for aquatic food sources is $910,000. The net present worth of 30 years of O&M is $0.

The estimated total present worth cost for the human health Selected Remedy is $92,000,000. The estimated net present worth of 30 years of O&M is $1,000,000.[17]

The costs presented are present worth costs. The present worth cost is the sum of the present value of the capital costs and the present value of the O&M costs over the period of performance. Consistent with current CERCLA guidance, estimates of present worth costs assume a discount rate of 7 percent (USEPA 2000b).

The estimated costs in these detailed cost estimate tables are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost, consistent with RI/FS guidance.

[17] Costs for cleanup at mine and mill sites with potential human health exposures are included in the estimated costs for the Selected Remedy for protection of the environment in the Upper Basin and Lower Basin.

12.1.3 Expected Outcomes of Selected Remedy

This section describes the expected outcomes of the Selected Remedy in terms of cleanup levels and residual risks, land uses, groundwater uses, and socio-economic and community impacts.

Cleanup Levels and Residual Risks

A tiered approach to lead soil remediation will be implemented. Soil with lead concentrations between 700 mg/kg and 1,000 mg/kg will require a barrier, such as vegetation, to prevent exposure and distribution of dust. Soil with lead concentrations above 1,000 mg/kg will require partial removal and a soil barrier on residential yards and common use areas. The Selected Remedy is expected to reduce the residual risk from lead in soil and house dust such that a typical child has no more than a 5 percent probability of having a blood lead level above 10 µg/dL and no more than a 1 percent probability of having a blood lead level above 15 µg/dL. The 100 mg/kg soil action level for arsenic, which is often co-located with lead, is expected to result in a residual lifetime RME excess cancer risk for a residential exposure scenario that is within EPA's target range of 10^{-6} to 10^{-4}. In addition, soil removals in garden areas are expected to reduce the residual risk from cadmium in homegrown vegetables such that the hazard quotient is less than 1. As previously mentioned, this will be accomplished through the removal of lead-contaminated soil, which is co-located with cadmium in garden soil.

The drinking water action levels are equal to the MCLs, as defined in Table 8.1-2. Implementation of the Selected Remedy is expected to reduce exposures to metals in drinking water such that the residual lifetime RME excess cancer risk for a residential exposure scenario is within EPA's target range of 10^{-6} to 10^{-4} and the residual risk from cadmium is less than a hazard quotient of 1.

Land Uses

Implementation of the Selected Remedy will allow residential land use. Commercial properties that are remediated may be redeveloped for residential land use.

The remedy does not address risks associated with practicing subsistence lifestyles, therefore, implementation of the Selected Remedy will not enable the practice of subsistence lifestyles in those areas of the Upper Basin and Lower Basin. Institutional controls programs will be used to limit exposures to contaminated fish and other aquatic food sources. The long-term goal is to create areas that support the practice of subsistence lifestyles.

Groundwater Uses

The remedy does not address potential future groundwater use. Additional available uses of groundwater will not result from implementation of the Selected Remedy.

Socio-Economic and Community Impacts

Implementation of the Selected Remedy is expected to improve the socio-economic conditions of the Coeur d'Alene Basin. Basin-wide sampling, analysis, and remediation of soil in residential properties will provide property owners the information necessary for lead disclosures required for property transactions. In addition, the increased protection of human health, focused on children, may create the certainty needed for many families. Soil remediation of selected recreational areas (picnic areas, beaches, and campgrounds) also will provide more certainty about lead exposure and will enhance recreation by visitors and local users. Other aspects of the remedy, such as establishing vegetative cover, remediating schoolyards, rights-of-way and commercial property, and providing drainage improvements to protect the remedy, will be coordinated with paint abatement programs and community redevelopment projects and should make the communities a more attractive place to locate business. The work associated with implementation of the Selected Remedy may provide additional jobs for the local labor force and contractors, including local supply contractors. Additionally, remediation dollars spent in the Silver Valley may create other opportunities for local businesses.

12.2 ENVIRONMENTAL PROTECTION IN THE UPPER BASIN AND LOWER BASIN

The remedial actions selected for environmental protection in the Upper Basin and Lower Basin, which are summarized in Table 12.2-1, will take approximately 30 years to implement.[18] During this period, EPA will evaluate the effectiveness and protectiveness of these remedial actions as well as the technical practicability of attaining ARARs, in particular ambient water quality standards for lead, zinc, and cadmium and compliance with the ESA and MBTA. During the five-year review process and at the end of this approximately 30-year period, EPA will evaluate and decide whether any additional remedial actions under CERCLA are necessary to attain ARARs and to provide for the protection of human health and the environment, and whether any ARAR waivers should be applied. Accordingly, consistent with 40 CFR 300.430(f)(1)(ii)(C), the remedial action selected by this ROD for environmental protection in the Upper Basin and Lower Basin is an interim measure and will become part of a final remedial action that will attain ARARs, unless an ARAR waiver is invoked at that time.

[18] The remedial actions described in this section include actions to protect human health at former mine and mill sites in the Upper Basin.

EPA expressly recognizes that after the selected remedial actions are implemented, conditions in the Upper and Lower Basin may differ substantially from EPA's current forecast of those future conditions, which is solely based on present knowledge. The tremendous amount of additional knowledge that will be gained by the end of this period through long term monitoring and five-year review processes may provide future bases for ARAR waivers. In addition, this new information and advances in science and technology may allow for additional actions to achieve ARARs and protect human health and the environment in a more cost-effective manner.

EPA recognizes that the State of Idaho has not concurred in the selection of any remedial action beyond those selected in this ROD. Furthermore, after implementation of the remedies selected by this ROD, EPA commits not to take or select any additional remedial actions in the Upper Basin or Lower Basin without first consulting with the State of Idaho. EPA will also continue to work with the regulatory stakeholder group, which was instrumental in developing the actions selected in this ROD.[19] Land management agencies may elect to implement cleanup actions on properties within their management jurisdiction toward achieving the overall goals of the Selected Remedy.

The Selected Remedy for environmental protection in the Upper Basin and Lower Basin consists of priority cleanup actions that could be implemented within an approximately 30-year period and would make significant progress toward protection of human health and the environment, ARAR compliance, effectiveness, implementability, and cost effectiveness. This remedy was also the Preferred Alternative in the Proposed Plan.

The priority actions included in the remedy were selected to achieve benchmarks, which are near-term objectives that will serve as landmarks and measurements to evaluate the progress of the remedy toward achievement of the long-term goals. The identification of benchmarks and prioritization of actions were based on knowledge gained during the RI/FS process and extensive discussions with stakeholders in meetings and weekly conference calls. Key areas of focus included identification of benchmarks that would be achievable within the time period of the Selected Remedy, appropriate measures of success, and actions necessary to achieve the benchmarks. These discussions drew heavily on the large amount of environmental data collected over time (e.g. water quality data and fish surveys) and the extensive experience of stakeholders in the Basin. The benchmarks are shown in Table 12.2-1.

12.2.1 Description of the Selected Remedy

The Selected Remedy is a prioritization of the numerous actions needed for protection of human health and the environment. As discussed in Section 7.2 of this ROD, the Coeur d'Alene Basin

[19] The regulatory stakeholder group that participated in the development of the Selected Remedy included the states of Idaho and Washington, the Coeur d'Alene and Spokane Tribes, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and U.S. Forest Service. The U.S. Geological Survey provided technical assistance.

EcoRA evaluated data regarding the impacts of mining-related hazardous substances on the environment. The EcoRA determined that sufficient information exists to demonstrate the presence of high concentrations of metals in the soil, sediment, and surface water in the Basin. These metals pose substantial risks to the animals and plants that inhabit the Basin. The results of the EcoRA indicate that most Basin watersheds in which mining has occurred and a large portion of the Basin down gradient of mining areas are ecologically degraded by mining-related hazardous substances. This ecological degradation has manifested itself in observable effects in the Basin plants and animals. Furthermore, if remediation is not conducted, the effects will continue for the foreseeable future.

These demonstrated effects and future risks predicted in the EcoRA provide the basis for identifying ecological remedial actions in the ROD. Given the extensive area of contamination, EPA worked with Basin stakeholders to identify priority actions for protecting the environment. Priority issues were grouped into three areas as an initial primary focus with respect to environmental protection:

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** High concentrations of these metals have harmful effects on fish and other aquatic receptors, as described in Section 7.2. Some native fish, including the cutthroat trout, bull trout, and sculpin, are particularly sensitive to dissolved metals.

- **Lead in floodplain soil and sediment.** Existing lead contamination has harmful effects on waterfowl and other ecological receptors, as described in Section 7.2.

- **Particulate lead in the surface water.**[20] Lead transported downstream in the river system is a continuing source of contamination for the Coeur d'Alene River, Coeur d'Alene Lake, and the Spokane River. Lead transported in the river system has impacted recreational areas in the Lower Basin and the Spokane River, resulting in posted health advisory signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands and floodplains. The potential exists for future particulate lead transport and recontamination of recreation and feeding areas cleaned up as part of the Selected Remedy.

These three priority issues represent the primary environmental problems in the Basin. The prioritized actions of the Selected Remedy were identified based on their potential to achieve benchmarks for reduction of environmental impacts related to these three priority issues. These actions were incorporated into the selected remedies for Ninemile Creek, Canyon Creek, Pine

[20] Particulate lead is associated with sediment particles transported in surface water. Particulate lead is subject to deposition in quiescent areas, whereas dissolved and colloidally-bound lead are not deposited in quiescent areas.

Creek, the South Fork, and the lower Coeur d'Alene River, as well as associated riparian areas, lateral lakes, wetlands, and agricultural areas in the Lower Basin.

Protection of riparian and riverine resources is an important environmental consideration in the Basin. Based on the results of the risk assessment, toxic conditions exist for migratory birds, other wildlife, and vegetation in the riparian and riverine corridor throughout the Basin. Actions taken within the riparian and riverine zones will also be designed to increase protection of receptors in these habitats. These actions will constitute an important step toward a fully functional riparian and riverine corridor.

In addition to environmental protection, the actions described in the following sections would have significant human health benefits, particularly for children who recreate in the Lower Basin and individuals who would choose to practice a subsistence lifestyle. The potential exposure pathways include ingestion or dermal contact with soil and sediment at beaches and other common use areas; ingestion of native vegetables; ingestion of fish caught in Basin waters; exposure to soil at waste piles; and ingestion of untreated surface water. The PHD has identified children with elevated blood lead levels whose exposure was traced to use of beaches and recreational areas in the Lower Basin.

Based on current estimates of remedy effectiveness, the Selected Remedy would be expected to achieve about 50 to 70 percent of the dissolved metals load reduction in the Upper Basin (URS 2002a), measured in the South Fork at Pinehurst, that would be anticipated from full implementation of Ecological Alternative 3 for about 19 percent of the estimated cost of Ecological Alternative 3. Table 12.2-1 summarizes the Selected Remedy for environmental protection in the Upper Basin and Lower Basin.

Dissolved Metals in Rivers and Streams

High levels of dissolved metals, particularly zinc and cadmium, exist in the river system in the Basin. The Upper Basin is the primary source of dissolved metals. Dissolved metals concentrations and impacts from mining currently prevent the river system from fully supporting aquatic receptors, including native fish.

The widespread occurrence of tailings-impacted sediments will make it difficult to reduce dissolved metals concentrations throughout the entire Basin to levels that comply with federal and state water quality standards and fully support some sensitive native fish species. However, further improvements to the ecosystem can begin in the short term through implementation of the Selected Remedy and continue for many decades when remedial actions are combined with natural recovery. Implementing the Selected Remedy will allow some localized portions of the impacted areas to return to levels that would greatly improve the ecosystem.

The benchmark of the Selected Remedy is reduction of dissolved metals to concentrations that allow substantial improvement to the fisheries and the ecosystem of the South Fork and some of its tributaries. Fish and aquatic organisms that are more tolerant of metals than native fish could return more quickly. The population and species diversity of fish and aquatic organisms are expected to continue to improve as cleanup progresses in the Basin. To the degree practical, as actions affecting surface water quality are implemented, adjacent riparian and riverine areas would be addressed in order to protect species that inhabit these areas. Re-establishment of fish populations using stocking is not anticipated.

As part of the development of the fisheries benchmarks, EPA and others examined fisheries conditions throughout the Coeur d'Alene River Basin (USEPA 2001d). The fisheries conditions were grouped into tiers based on fish populations, types of species present, and other factors. The tiers range from Tier 0 (no fish present) to Tier 5 (fully-functional native fishery, including the presence of sensitive species). Water chemistry and habitat conditions associated with each tier were compiled based on observed conditions in the Basin. The fishery tier definitions are provided in Table 12.2-1. These water chemistry and habitat conditions are based on the current understanding of the conditions consistent with the fisheries tiers. As fishery conditions are monitored during and after cleanup, the benchmark chemistry and habitat conditions may need to be modified.

EPA coupled the data characterizing existing water quality conditions and fish populations with a probabilistic model that examined anticipated outcomes of conducting varying amounts of the response actions comprising Alternative 3. Through this means, EPA was able to prioritize cleanup areas for the Selected Remedy and estimate outcomes in terms of anticipated water quality conditions and consequent fish populations. Priority areas for the Selected Remedy have been identified based upon where the most load reduction can be practically achieved and where the best opportunities exist for re-establishing a sustainable trout fishery, with an emphasis on native fish. Implementation of the Selected Remedy will result in progress toward compliance with state and federal water quality standards and criteria. An example of this analysis is provided in the subsequent description of the Selected Remedy for Ninemile Creek.

Table 12.2-1 identifies the benchmarks and summarizes the remedial actions for Upper Basin areas, including Canyon Creek, Ninemile Creek, Pine Creek, and the South Fork. Ninemile Creek and Pine Creek are initial priority areas for fisheries improvements. The discharge from Canyon Creek is a priority for reducing metals loads to the South Fork.

Table 12.2-2 summarizes the fisheries benchmarks, the water chemistry and physical conditions that exist currently, and those that would be needed to achieve the fisheries benchmarks. The Selected Remedy includes those actions that, based on existing information, would be needed to achieve the fisheries benchmarks. These actions were used to develop the estimated costs presented in Section 12.2.2. As the remedy is implemented and monitored, the cleanup actions

ultimately taken could differ, based on the additional knowledge gained, from those currently identified.

Ninemile Creek. Ninemile Creek was identified as a focus of the Selected Remedy for the following reasons:

- Ninemile Creek is essentially devoid of fish in the area of mining impacts
- Habitat conditions for aquatic receptors and other animals are good compared to other highly-impacted areas, such as Canyon Creek
- Water quality impacts largely stem from a few large sources in unpopulated areas of the East Fork
- The Selected Remedy could build upon removal actions already completed or underway
- The experience gained in Ninemile Creek could be applied to other highly-impacted drainages, such as Canyon Creek

The description of the Selected Remedy for Ninemile Creek is organized by three stream reaches. These are:

- East Fork above the Success mine site
- East Fork from Success to its confluence with the mainstem
- Mainstem Ninemile Creek

Areas identified for cleanup during implementation of the Selected Remedy are shown in Figure 12.2-1.

East Fork Above the Success Mine Site. The benchmark for this reach is to improve conditions to allow natural re-establishment of a salmonid fishery, with an emphasis on native species (Tier 3 fishery). The fishery would not necessarily include the presence of metals-sensitive species (such as the bull trout), reproduction, or the presence of juveniles. It is estimated that a reduction of metals loads of greater than 80 percent will be needed to achieve dissolved metals concentrations of less than 7 times the zinc chronic AWQC, which is the target concentration range for a Tier 3 fishery.

In addition to reductions in metals concentrations in the creek water, the cleanup would be designed to mitigate mining impacts on the riverine and riparian zone to protect fish, migratory birds, and other animals. An additional 1.7 miles of low-risk riverine and riparian area would be gained from the cleanup.

Initial actions in the East Fork of Ninemile Creek will include cleanup of dissolved metals sources in the reach from the headwaters area to the Success mine site. The source areas within the East Fork drainage identified for cleanup are shown in Figure 12.2-2. This cleanup has been initiated through removal actions by the mining companies and the State of Idaho at the Success and the Interstate Mill Site, as well as the planned cleanup actions at the Rex Mine and Mill site. Surface water monitoring data show that, historically, the Interstate and Success sites are the largest sources of metals loads to Ninemile Creek. Specific performance goals for the removal actions at these source areas have not been established. As part of the Selected Remedy, performance goals will be established based on the benchmarks for this reach. Should the performance goals not be achieved as a result of the removal actions, additional actions will be undertaken as part of the Selected Remedy. Initial monitoring results for the Interstate and Success sites are presented in Harvey (undated) and Golder Associates (2001), respectively.

East Fork from Success to Its Confluence with the Mainstem. Because current metals concentrations are higher in this reach, it is not anticipated that re-establishment of a resident fishery would occur as a result of implementation of the Selected Remedy. The benchmark for this reach is to improve conditions to enable migration of fish between the upstream reaches and the mainstem (Tier 1 fishery).

The State of Idaho is conducting a removal action at the Success site that consists of groundwater collection and treatment and surface water run-on controls. Depending on how successful the removal action is, additional actions in this reach could include scale-up to full-scale treatment at the Success site, relocation of the Success tailings pile, or construction of a treatment pond to remove metals from the creek water. The Selected Remedy would include monitoring of the removal action to ensure the actions are consistent with the benchmarks established for the Selected Remedy.

The treatment pond, if needed to achieve the benchmarks for the mainstem of Ninemile Creek, would treat creek water collected from the East Fork upstream of its confluence with the mainstem. The location of the treatment pond and its design capacity would be selected during remedial design, dependent on the results of treatability testing and siting considerations. Conceptually, the treatment pond would be very similar to the treatment pond identified for Canyon Creek. The treatment pond is described in further detail in the subsequent section that describes the Selected Remedy for Canyon Creek. It is anticipated that initial design studies would be implemented in Canyon Creek, and the experience gained would be applied in Ninemile Creek, if surface water treatment is needed. Preliminary estimates indicate a treatment

pond with a design capacity of 10 cubic feet per second could remove 60 to 70 percent of the annual load of zinc that discharges from the East Fork into the mainstem of Ninemile Creek. The load reductions and estimated costs for the treatment pond are based on the assumption that all remedial actions in the East Fork have been implemented.

Mainstem Ninemile Creek. The benchmark for this reach is to improve conditions to enable migration of fish between the South Fork of the Coeur d'Alene River and the East Fork of Ninemile Creek (Tier 1 fishery). The Selected Remedy does not include cleanup actions within this reach to improve water quality. Improvements in water quality would result from cleanup actions implemented in the East Fork. At the mouth of Ninemile Creek, a culvert currently impedes fish passage. This would also need to be addressed, but is not included in the Selected Remedy.

The actions implemented in the Ninemile Creek watershed during the Selected Remedy would also include measures to address protection of human health at the Day Rock mine and mill site. The potential exists that some or all of the site may be preserved for its historical value. Any remedial design/action would be conducted in accordance with the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, 36 CFR Parts 60, 63, and 800 as described in Section 13.

EPA used a probabilistic analysis that predicted water quality conditions that would result from conducting varying amounts of the response actions comprising Alternative 3 to establish fisheries benchmarks and evaluate the scope of cleanup needed to achieve the benchmarks. An example of this analysis for the mainstem of Ninemile Creek follows.

Figure 12.2-3 illustrates the use of the probabilistic analysis to predict the probability of achieving the water quality conditions (expressed as multiples of the zinc AWQC) consistent with various fisheries tiers as a function of the cleanup effectiveness. Under complete implementation of Alternative 3, the probabilistic analysis predicted less than a 25 percent probability of achieving water quality conditions consistent with a Tier 3 fishery (less than 7 times the chronic AWQC) for the mainstem of Ninemile Creek. Further, the analysis predicted approximately a 50 percent probability of achieving water quality conditions consistent with a Tier 2 fishery (less than 10 times the chronic AWQC), and greater than a 90 percent probability of achieving water quality conditions consistent with a Tier 1 fishery (less than 20 times the acute AWQC) under Alternative 3.[21]

[21] For a Tier 1 fishery (migratory corridor), the water quality benchmark is based on the acute AWQC because the fish would be present in the stream reach for only a limited time.

EPA and stakeholders recognized several tradeoffs associated with complete implementation of Alternative 3 in Ninemile Creek.

- High concentrations of metals in the reach of the East Fork from Success downstream to the confluence of the East Fork and the mainstem would limit re-establishment of a resident fishery throughout Ninemile Creek.

- There would be concerns with the implementability of Alternative 3 in the mainstem due to the presence of private development.

- Significant short-term impacts would be associated with complete implementation of Alternative 3.

- The estimated present worth cost of complete implementation of Alternative 3 in Ninemile Creek is $59 million. The additional actions for full implementation of Alternative 3 were considered less effective than actions to reduce dissolved metals from other impacted tributaries, e.g., Canyon Creek.

Because of these tradeoffs, EPA and stakeholders elected to establish a benchmark for the mainstem of achieving a migratory corridor for fish from the South Fork to the East Fork of Ninemile Creek. The probabilistic analysis was used to evaluate the scope of Alternative 3 response actions needed to achieve the benchmark, as follows.

For complete implementation of Alternative 3 above Success together with the removal actions at the Success, Interstate, and Rex sites, the probabilistic analysis predicted a 35 percent probability of achieving water quality conditions consistent with a Tier 1 fishery (20 times the acute AWQC) in the mainstem as a result of implementation of the Selected Remedy, as shown in Figure 12.2-3. There is evidence for fish migration at concentrations greater than 20 times AWQC, and the Selected Remedy may achieve the benchmark despite an estimated probability of achieving less than 20 times the acute AWQC that is less than 50 percent. However, should monitoring indicate the benchmark would not be achieved, the Selected Remedy includes a contingency for construction of a treatment pond to treat the discharge from the East Fork, in addition to the cleanup actions described above. For an estimated average removal of 69 percent of the dissolved metals load in the East Fork by the treatment pond, the estimated probability of achieving water quality conditions consistent with a Tier 1 fishery would increase to approximately 80 percent.

Figure 12.2-4 depicts the anticipated results of the Selected Remedy in Ninemile Creek compared to Alternative 3. This figure indicates the Selected Remedy will remove approximately 84 percent of the dissolved metal load, remediate approximately 62 percent of the volume of contaminated material, take up 87 percent of the regional repository requirements, and

represent 61 percent of the cost relative to full implementation of Alternative 3. These percentages were calculated assuming all actions contemplated under the Selected Remedy, including additional actions at the Interstate, Rex, and Success sites and construction of a treatment pond near the confluence of the East Fork and the mainstem, will need to be implemented to achieve the water quality benchmarks.

The long-term goals for Ninemile Creek include the return of a fully-functional native fishery and full protection of riparian and riverine zone birds and other animals. EPA believes that additional cleanup actions on the mainstem and an extended period of natural recovery would be needed to achieve the long-term goals in Ninemile Creek.

Pine Creek. Considerable cleanup work has already been conducted in the Pine Creek watershed, particularly by the BLM. Pine Creek currently supports an adult fishery, including brook trout and a smaller population of native cutthroat trout. However, populations and reproduction in some reaches of the creek are limited, primarily by stream structure and riparian zone conditions that have been degraded by mining impacts, with metals concentrations being a secondary limiting factor. The benchmark for Pine Creek is to improve conditions to allow natural increases in salmonid populations, with an emphasis on native fish, and to improve conditions to allow for spawning and rearing.

Areas identified for cleanup during the Selected Remedy are shown in Figure 12.2-5. The actions implemented in the Pine Creek watershed would build on the work already conducted by the BLM. Actions would include bank and bed stabilization and riparian zone revegetation to mitigate the effects of mining impacts. The actions would also include hot spot removals within the stream and at former mine and mill sites, including the Upper and Lower Constitution, Highland-Surprise, Nevada-Stewart, Hilarity, Little Pittsburg, Sidney (Denver Creek), and Nabob. Several of these sites (Upper and Lower Constitution, Highland Surprise, Nevada-Stewart, Hilarity, and Nabob) are also a concern for protection of recreational users. As with work in Ninemile Creek, lessons learned while implementing the Selected Remedy in Pine Creek can be applied to other areas in the Basin requiring additional cleanup.

During the development of the priority actions included in the Selected Remedy for Pine Creek, EPA, in consultation with stakeholders, evaluated other potential response actions anticipated in Alternative 3 in light of what they would accomplish over an approximately 30-year time period. Dissolved metals concentrations in Pine Creek are currently generally much lower than in Ninemile Creek and Canyon Creek, and it was concluded that the cleanup of sites that are smaller sources of metals discharges than those included in the Selected Remedy would not be necessary at this time to achieve the benchmarks of increasing salmonid populations and improving spawning and rearing conditions.

Conversely, it was concluded that a lower level of cleanup would be ineffective in reducing metals concentrations from current conditions (10 to 20 times the AWQC in the East Fork of Pine Creek) to conditions needed to achieve the fisheries benchmarks (less than 7 times the chronic AWQC to support a salmonid fishery). Mitigation of mining impacts would be needed to provide stream structure and riparian zone conditions supportive of the benchmarks for fisheries improvements, as well as to provide protection of riparian zone animals. A lower level of cleanup would also not be protective of recreational users at former mine and mill sites.

Figure 12.2-6 depicts the anticipated results of the Selected Remedy in Pine Creek compared to Alternative 3. This figure indicates the Selected Remedy will remove approximately 29 percent of the dissolved metal load, remediate approximately 26 percent of the volume of contaminated material, take up less than 1 percent of the regional repository requirements, and represent 32 percent of the cost relative to full implementation of Alternative 3.

The long-term goals for Pine Creek include the return of a native fishery and full protection of riparian and riverine zone birds and other animals. EPA believes that additional cleanup actions and a period of natural recovery would be needed to achieve the long-term goals in Pine Creek.

Canyon Creek. Canyon Creek is essentially devoid of fish below Burke as a result of high metals concentrations and severely degraded riverine and riparian conditions. Canyon Creek contributes more dissolved metals load to the South Fork than any other tributary, approximately 20 to 25 percent of the load in the South Fork at its confluence with the North Fork. The benchmark for Canyon Creek is to reduce dissolved metals loads discharging from the creek into the South Fork by at least 50 percent.

Implementation of a source-by-source cleanup in Canyon Creek, as is anticipated under Alternative 3, would be very difficult, costly, and time consuming. The Selected Remedy for approximately 30 years of work in Canyon Creek will focus on identifying cost-effective technologies for improving downstream water quality in the South Fork and mainstem Coeur d'Alene River and, ultimately, in Coeur d'Alene Lake and the Spokane River.

One potentially cost-effective approach that will be evaluated is to intercept the creek water in lower Canyon Creek and remove metals using passive treatment. Under this approach, the individual metals sources in the Canyon Creek watershed would not be addressed during the Selected Remedy. Should creek water treatment prove effective after pilot studies, full-scale treatment would be implemented as part of the Selected Remedy in Canyon Creek. The development of innovative and potentially cost-effective water treatment in Canyon Creek would be effective in achieving desired reductions and potentially have application in other parts of the Basin (e.g., Ninemile Creek). If passive treatment does not prove effective, alternative treatment and control systems to achieve the benchmark of at least 50 percent reduction of dissolved

metals loads would be evaluated. Alternative actions may be used based on an evaluation against CERCLA remedy selection criteria.

Because this approach is not anticipated to achieve the long-term goal of ecosystem recovery within Canyon Creek, EPA believes additional work would be necessary in Canyon Creek. Source control efforts conducted elsewhere in the Basin (e.g., Success and Interstate in Ninemile Creek) will be monitored and evaluated such that subsequent efforts in Canyon Creek can be performed in a cost-effective manner.

A conceptual drawing of a passive treatment system using a treatment pond is depicted in Figure 12.2-7 (USEPA 2001g). Creek water would be diverted into the treatment pond at flow rates up to the treatment design capacity. At higher flows, the creek flow above the design capacity would be bypassed without treatment. The diverted water would percolate through a bed of reactive media, which would remove metals from the water. The treated water would be discharged back into the creek.

Because groundwater containing relatively high concentrations of metals discharges to surface water throughout the reach downstream of the Hecla-Star tailings ponds, a diversion location as far downstream as is feasible would maximize removal of metals. The location of the treatment pond and its design capacity would be selected during remedial design, dependent on the results of treatability testing and siting considerations. A possible location of the treatment pond is shown in Figure 12.2-8.

The expected value of the dissolved zinc load in Canyon Creek after remedy implementation is estimated to be 234 pounds per day, a reduction of 322 pounds per day compared to the expected value calculated from surface water data collected from 1991 to 1999. The expected value is based on a probabilistic analysis of potential treatment pond performance and considers potential load reductions from removal actions conducted by SVNRT and stabilization of sediment sources that will be conducted as part of the Selected Remedy. The analysis of potential treatment pond performance is based on an assumed design capacity of 60 cfs. The sediment stabilization measures are described later in this section.

The Hecla-Star Tailings Ponds in lower Canyon Creek are a potentially significant source of dissolved metals to groundwater and surface water. The nature and extent of metals loading from the tailings ponds may affect placement and sizing of the treatment pond, and additional characterization of the loading may be conducted during design and siting studies for the treatment pond.

Disposal of treatment residuals (spent media and collected sediment) will be evaluated during remedial design. For the purpose of estimating costs, it was assumed the residuals will be disposed of in a solid waste repository. Regeneration of spent media is an option that will be evaluated during remedial design.

Selected remedies in Canyon Creek also include stabilization of dumps and stream banks that are sources of sediment and particulate metals in the creek, the South Fork, and the lower Coeur d'Alene River. The locations identified for stabilization are Tamarack, Omaha, Standard-Mammoth Loading Area, Standard-Mammoth mill, Hercules No. 5, Oom Paul, Ajax No. 3, Hecla (Burke), Tiger-Poorman, West Star, Gertie, and Gorge Gulch. The locations of these sources areas are shown in Figure 12.2-9.

The actions implemented in the Canyon Creek watershed during the Selected Remedy would also include protection of human health at two former mine and mill sites where potential exposures were identified (Standard-Mammoth mill and Sisters mine). Areas identified for cleanup in the Selected Remedy are shown in Figure 12.2-9.

Additional actions may also be needed at the Burke concentrator. This site is currently fenced to limit access. The potential exists that some or all of the site may be preserved for its historical value. Should people be allowed on the site as a result of the historical preservation, or should access otherwise become available, cleanup actions would be needed to limit exposures to metals. The location of the Burke concentrator is shown in Figure 12.2-9.

During the development of the priority actions included in the Selected Remedy for Canyon Creek, EPA, in consultation with stakeholders, evaluated other potential response actions anticipated in Alternative 3 in light of what they would accomplish over an approximately 30-year time period. Canyon Creek is the source of 20 to 25 percent of the dissolved metals load in the South Fork, and a relatively large reduction of metals load from Canyon Creek would be needed to meet the benchmark for improvements in the South Fork fish migration corridor, as well as to meet benchmarks for reductions in dissolved metals concentrations in the Spokane River. A source-by-source cleanup in Canyon Creek was considered; however, this approach would require extensive removals and thus be difficult to implement within the 30-year timeframe of the Selected Remedy. The effectiveness of this approach would be uncertain, and the cost would be high.

Not controlling the metals loading from Canyon Creek was also considered. Not controlling the metals loading from Canyon Creek would result in continued significant and unacceptable metals discharges to downstream waters and would not contribute to achieving the benchmark of improving the fisheries and ecosystem of the South Fork or reducing dissolved metals concentrations in the Spokane River.

Figure 12.2-10 depicts the anticipated results of the Selected Remedy in Canyon Creek compared to Alternative 3. This figure indicates the Selected Remedy will remove approximately 73 percent of the dissolved metal load, take up approximately 13 percent of the regional repository requirements, and represent 23 percent of the cost relative to full implementation of Alternative 3. The low percentage of regional repository space required reflects the Selected Remedy's focus on reducing metal loading to the South Fork, not Canyon Creek.

The long-term goals for Canyon Creek include the return of a native fishery and full protection of riparian and riverine zone birds and other animals. EPA believes that additional cleanup actions and an extended period of natural recovery would be needed to achieve the long-term goals for Canyon Creek.

South Fork. The fisheries benchmark for the South Fork[22] is to improve conditions to support a higher fish density (Tier 2+ to 3 fishery). Improvements in conditions would result largely from implementation of the selected remedies for Canyon Creek, Ninemile Creek, and Pine Creek. In the floodplain of the South Fork (in areas outside of the Bunker Hill Box), tailings "hot spots" would be excavated and disposed of. Under separate regulatory authorities, BLM is also evaluating the need for excavation and/or capping of BLM-owned lands in this area. These activities would be consistent with the overall goal of protection of human health and the environment. Streamside actions would include stabilization and bioengineering of the stream channel and banks. These actions would enhance the South Fork as a migratory corridor for fish by increasing the amount of pools and shade and would provide initial protection of animals that inhabit the riparian zone. Locations of tailings hot spots are shown in Figure 12.2-11.

The remedy in the South Fork watershed would also include cleanup at six sites that have been selected because of potential human health exposures, but also have ecological impacts:

- National Millsite
- Morning No. 6 Mine and Millsite
- Golconda
- Hercules Millsite in Wallace
- U.S. Bureau of Mines Impoundment
- Silver Dollar Mine

The locations of the National, Morning, and Golconda sites are shown in Figure 12.2-12. The locations of the Hercules, U.S. Bureau of Mines, and Silver Dollar sites are shown in Figure 12.2-11.

[22] For the purposes of describing the Selected Remedy, this area includes the South Fork from its headwaters to its confluence with the North Fork and all tributaries except Canyon Creek, Ninemile Creek, Pine Creek, and tributaries within the Bunker Hill Box.

During the development of the priority actions included in the Selected Remedy for the South Fork, EPA, in consultation with stakeholders, evaluated other potential response actions anticipated in Alternative 3 in light of what they would accomplish over an approximately 30-year time period. Sediments and associated groundwater are the primary sources of dissolved metals originating from the South Fork floodplain. More extensive metals reductions would involve additional removal or containment of sediments (with or without treatment of associated groundwater). The additional removal or containment and treatment actions would involve sediments that are generally lesser sources of metals or more difficult to access due to the depth of the sediment or their location beneath infrastructure or private property. It was concluded that these additional actions would contribute less to achieving the benchmark of improving the South Fork as a fish migration corridor, would be less implementable, and would be more costly compared to the "hot spot" removal actions included in the Selected Remedy.

Conversely, removal of the remaining accessible floodplain hot spots, as is planned during the Selected Remedy, would be readily implementable and cost-effective for reducing dissolved metals load and increasing protection of humans and other animals that use these areas. A lower level of cleanup than is proposed for the Selected Remedy would also not be protective of humans potentially exposed to metals at the seven former mine and mill sites identified for cleanup.

As with Ninemile, Canyon, and Pine Creeks, lessons learned while implementing the Selected Remedy in the South Fork can be applied to other areas in the Basin requiring cleanup.

Figure 12.2-13 depicts the anticipated results of the Selected Remedy in the South Fork compared to Alternative 3. This figure indicates the Selected Remedy will remove approximately 7 percent of the dissolved metal load, remediate approximately 6 percent of the volume of contaminated material, take up 2 percent of the regional repository requirements, and represent 5 percent of the cost relative to full implementation of Alternative 3. The low percentages reflect that cleanup in the tributaries is more cost effective than cleanup in the South Fork at this time.

The long-term goals for the South Fork include the return of a native fishery and full protection of riparian- and riverine-zone birds and other animals. EPA believes that additional cleanup actions and an extended period of natural recovery would be needed to achieve the long-term goals for the South Fork.

Other Upper Basin Areas. Improvements in water quality in the river system will be strongly dependent on reductions in metals loading achieved in areas along the South Fork, including the Bunker Hill Box. Approximately one-half of the dissolved metals load in the South Fork above the North Fork confluence comes from the river reach that includes the Bunker Hill Box. Actions taken to date within the Bunker Hill Box are expected to result in improvements in water

quality; however, it is anticipated that additional actions will be needed to meet cleanup goals. These additional actions would likely include control of metals loading from groundwater to surface water, including the reach adjacent to the CIA. As described in Section 4.1.2, implementation of Phase II of the Non-Populated Areas ROD will address site surface water and groundwater cleanup. EPA anticipates surface water and groundwater cleanup actions to be implemented through future RODs, amendments to RODs, or ESDs for the Bunker Hill Box and to parallel implementation of the Selected Remedy.

Lead in Floodplains Soil and Sediment

Soil and sediment throughout the floodplains of the lower Coeur d'Alene River Basin are contaminated with lead that has washed downstream over the years from Upper Basin mining activities. Sediments are also remobilized and transported into Coeur d'Alene Lake and the Spokane River. Lead-contaminated sediments in the floodplains (including wetlands, bottom sediment of the lateral lakes, and low-lying upland areas) have caused adverse effects to wildlife. Notably, waterfowl (e.g., tundra swan and ducks) ingest highly contaminated sediment to the extent that many have suffered toxic effects or died from ingestion of lead. The USFWS has documented numerous deaths among waterfowl and small mammals in the South Fork and Coeur d'Alene River floodplain.

A long-term goal is to reduce metals exposure of plants, wildlife, and fish throughout these areas to levels that are protective of the ecosystem. Because the total contaminated floodplain area in the Lower Basin is so large, it is important to prioritize areas to improve specific, priority areas within the ecosystem. For example, one benchmark is to reduce waterfowl mortality by providing additional safe feeding areas. Site-specific data from waterfowl feeding studies indicate a lead cleanup level of 530 mg/kg in sediment for protection of waterfowl.

It was recognized that all areas needing long-term cleanup could not be addressed effectively in the Selected Remedy. Resource agencies have identified high-priority areas in the Lower Basin based on potential for contributing to lead poisoning of wildlife, high use by waterfowl, high levels of lead in sediments, availability of site access, and relatively low potential for recontamination during flood events. The areas identified as top priorities are:[23]

- Thompson Lake (300 acres of wetland area and 256 acres of lake area)
- Thompson Marsh (59 acres of wetland area and 122 acres of lake area)
- Bare Marsh (165 acres of wetland area)

[23] The acres of lake area shown are the entire areas of the lakes. To develop estimated costs, it is anticipated contaminated sediments will be cleaned up to a water depth of six feet (which represents an average of approximately 25% of the total lake area). These water depths represent the highest use feeding areas and, consequently, the areas of greatest exposure to waterfowl and other animals.

- Medicine Lake (198 acres of wetland area and 230 acres of lake area)
- Lane Marsh (213 acres of wetland area)
- Cave Lake (190 acres of wetland area and 746 acres of lake area)
- Anderson Lake (44 acres of wetland area and 505 acres of lake area)

The areas identified for cleanup during the Selected Remedy are shown in Figure 12.2-14. An additional goal of the Selected Remedy is to increase the amount of safe feeding areas by identifying and cleaning up some areas that are currently used for agriculture. These actions would be taken in cooperation with the current owners. It is estimated an additional 1,500 agricultural acres may be cleaned up. In total, about 4,500 acres of safe waterfowl feeding areas could be provided by the cleanup actions taken under the Selected Remedy.

A combination approach is envisioned for these areas, depending on the specific conditions (e.g., depth of contaminated sediments) within a given wetland or lake. Contaminated materials would be excavated from some areas and transported to an upland repository or consolidated within the lateral lake being cleaned up. Other areas would be capped with a layer of clean soil to prevent feeding birds from becoming exposed to metals. Excavation depths and cap thicknesses will be selected to prevent direct exposure of waterfowl, fish, and other animals to contaminated sediments. Excavation depths and cap thicknesses are anticipated to average approximately one foot. If feasible, capping materials could be obtained from clean subsurface sources within the wetland unit, with the possible result of creating deeper ponded areas to increase feeding opportunities for waterfowl and fish. Soil treatment to reduce lead bioavailability may be applied in selected areas if effective treatment technologies are identified in pilot tests underway at this time.

The Selected Remedy focuses on cleaning up sediments in the portions of the lateral lakes where the water depth is six feet or less. These water depths represent the highest use feeding areas and, consequently, the areas of greatest exposure to waterfowl and other animals. Monitoring of the effects of the cleanup would include measuring the concentrations of lead in brown bullhead fish. The brown bullhead has been identified by the USFWS as the best indicator species for the ecological health of the lakes. Should lead concentrations in the brown bullhead remain elevated following completion of cleanup and waterfowl mortalities continue, the need for additional actions would be evaluated. Monitoring of blood lead concentrations in floodplain animals such as migratory birds is also a primary biomonitoring tool that may be used in evaluating cleanup activities.

Although the areas identified for cleanup during the Selected Remedy have relatively low recontamination potential, some recontamination potential does exist. Hydraulic controls (floodgates) and levees could be used to limit recontamination of treated areas. These structures could have effects on the overall hydrology of the river/floodplain system. The need for these

types of structures and their effect on the hydrology of the river/floodplain system would be evaluated during remedial design.

During the development of the priority actions included in the Selected Remedy for mitigation of the impacts of lead in floodplain areas, EPA, in consultation with stakeholders, evaluated other potential response actions anticipated in Alternative 3 in light of what they would accomplish over an approximately 30-year time period. Cleanup at additional areas was evaluated, including:

- Harrison Slough
- Blue Lake
- Black Lake
- Swan Lake
- Blessing Slough
- Moffit Slough
- Hidden Marsh
- Campbell Marsh
- Killarney Lake
- Strobl Marsh
- Lane Marsh (only partially addressed in the Selected Remedy)
- Black Rock Slough
- Bull Run
- Porter Slough
- Rose Lake
- Orling Slough
- Cataldo Slough
- Mission Slough

Although cleanup of these wetlands may be needed to protect migratory birds under the MBTA, they were not included in the Selected Remedy because of higher recontamination potential and poorer access. The scope of actions that could be implemented in the approximately 30-year response timeframe was also limited by the need to further develop and verify effective, implementable methods of reducing lead exposure and recontamination. The use of management techniques to discourage waterfowl feeding at contaminated areas also was also considered. These techniques were not included in the Selected Remedy because of concerns about reliability and the limited extent of alternative uncontaminated feeding areas for waterfowl.

The Selected Remedy includes remediation of 4,528 acres of wetland and lateral lakes in the lower basin. Studies conducted during the remedial investigation indicate that over 18,000 acres of waterfowl habitat exceed adverse effect levels and over 15,000 acres exceed lethal thresholds.

Over 13,000 acres that exceed the adverse effect levels are not targeted for cleanup in the Selected Remedy.

The scope of cleanup included in the Selected Remedy reflects a reasonable amount of implementable work, for an approximately 30-year timeframe, toward achieving protection of waterfowl and other animals, as well as a first step toward protection of birds covered under the MBTA. The work will be sequenced to ensure that current land uses (e.g., recreational) will be available throughout the period of cleanup.

It is expected that sediments deposited in these wetlands during future floods would generally decrease in metals content over time as a result of cleanup of the Upper Basin, the river banks of the mainstem Coeur d'Alene River, and, to a lesser extent, the bed of the river. If the metals content of sediments decreases with time, recontamination would be less important for these future wetlands cleanup efforts.

An important goal is full return of cultural resources and recreational uses in the Basin. Remedies that address wetland risks to waterfowl would also address potential human exposures at water potato grounds and recreational beaches. Institutional controls, such as warning signage, will remain in place in the Lower Basin until they are no longer needed to protect human health, but are not preferred as the long-term solution.

Particulate Lead in Surface Water

Lead-bearing sediment in surface water is transported downstream to Coeur d'Alene Lake and the Spokane River, and washes across and contaminates the floodplain in the Lower Basin during flood events. Three sources are suspected to contribute the major particulate lead load in the Lower Basin: sediments derived from the Upper Basin, contaminated river bank sediments in the Lower Basin, and river bed sediments in the Lower Basin. The banks in many areas of the Lower Basin are steep and actively eroding into the river. River bed sediments have become contaminated from materials transported from upstream and from the eroding river banks. A portion of this sediment is entrained during high flow events, transported downstream in the river, and deposited over the floodplain.

One goal of the Selected Remedy is to reduce the lead load in sediment transported and deposited in downstream areas of the lateral lakes, Coeur d'Alene Lake, and Spokane River. Reduction of lead-bearing sediment in surface water is necessary to minimize recontamination of cleaned areas, prevent the occasional exceedances of drinking water standards in Coeur d'Alene Lake, protect wildlife from exposure, and reduce lead concentrations and AWQC exceedances in the Spokane River. During high flow in 1999, the dissolved lead concentration at the outlet from Coeur d'Alene Lake exceeded the chronic AWQC for lead by a factor of approximately two (USEPA 2001b, Table 5.7-8), which suggests a reduction in load of at least 50 percent may be

needed during high-flow events to reduce year-round dissolved lead concentrations to below the chronic AWQC in the Spokane River.

Initially during implementation of the Selected Remedy, cleanup actions would focus on areas with the most actively eroding river banks. The reaches for bank stabilization will be prioritized based on the degree of erosion occurring and the concentrations of metals in the riverbank sediments. Remedial actions would include a combination of bioengineering and removals, as appropriate, to allow re-establishment of a sustainable river ecosystem. The extent of removal of contaminated material would be determined by the concentrations of metals in the river bank material, the likelihood that stabilized banks will remain stable in the future, site accessibility, and the presence of infrastructure. A total of about 33 miles of river banks[24] that are highly susceptible to erosion are targeted for stabilization during the Selected Remedy. In addition to reducing particulate lead loading to the river, these actions would increase the area of low-risk riparian area adjacent to the river in these reaches. Potential redeposition of metal-enriched sediment onto remediated river banks after high-flow events would be evaluated as part of the remedial actions.

Cost-effective methods for river-bed sediment removal will also be evaluated and conducted during the Selected Remedy. The natural depositional areas around Dudley and the Cataldo Mission have been identified as the potential sites for sediment removal or management operations. The Dudley area is the location of relatively thick deposits of sediment containing high concentrations of lead and other metals. Fine-grained sediment from the South Fork and North Fork accumulates at this location. Upstream of the Dudley area, the area around the Cataldo Mission acts as a natural trap for coarser-grained sediment, which usually contains less lead, from the North and South Forks. Other sediment management techniques that may be viable alternatives to sediment removals for reducing particulate lead transport and providing long-term protection will also be evaluated during remedial design.

Sediments naturally accumulate in areas where the river leaves its bank during flood events. During implementation of the Selected Remedy, the feasibility of engineering these areas (referred to as "splays") as natural traps for sediment transported during flood events would be evaluated through pilot studies.

Monitoring and evaluation of the potential improvements resulting from pilot-scale and full-scale remedial actions during the Selected Remedy will be used to help guide the continuing and future implementation of cost-effective remedies for the Lower Basin.

[24] Measured as length of bank on one side of the river, not as river miles.

During the development of the priority actions included in the Selected Remedy for particulate lead in surface water, EPA, in consultation with stakeholders, evaluated other potential response actions anticipated in Alternative 3 in light of what they would accomplish over an approximately 30-year time period. Additional removal or stabilization actions, including banks less susceptible to erosion, was evaluated, but was considered to provide less overall protection of the environment compared to removal or stabilization of banks with high erosion susceptibility. More extensive removal of river-bed sediment was also evaluated, but was not included in the Selected Remedy because of the following considerations:

- Beginning with smaller scale removals to refine cost-effective sediment removal or management techniques
- Confirming that removal can be conducted in a manner that will not exacerbate lead movement downstream
- Limiting uncertainty with respect to repository capacity for disposal of the contaminated sediment removed from the river beds
- Limiting the area of removal work to natural sediment deposition areas, thereby limiting the effects of potential recontamination and effects on boating activities, while enhancing cost-effectiveness
- Insuring that the entire depth of contaminated sediment is excavated at the selected location(s) to eliminate the potential for adverse impacts as a result of exposing deeper, more contaminated sediments than those present on the surface of the river bed

EPA, in consultation with stakeholders, also evaluated a narrower scope of remedies. No action for river-bed sediments was evaluated; however, the bed sediments are a large source of particulate lead, which, when deposited in the lateral lakes during flood events, has had severe effects on wildlife. It was considered necessary to begin removing some of the most highly-contaminated sediments to reduce future downstream effects, as well as to begin developing cost-effective, implementable methods of sediment removal. Removal or stabilization of less length of contaminated river bank was also evaluated; however, removal of banks that are highly susceptible to erosion, as is proposed under the Selected Remedy, would be relatively implementable, could be conducted at a reasonable cost, and would increase protection of birds and animals in riparian areas. In addition, stabilization of a smaller amount of erosion-susceptible bank would likely result in a greater risk of downstream recontamination compared to the Selected Remedy.

12.2.2 Estimated Cost of the Selected Remedy

Detailed cost estimates are presented in the tables listed here.

- Table 12.2-3: Ninemile Creek. Cost estimates were developed both with and without costs for the contingent actions at removal action sites (Interstate, Success, and Rex) and the treatment pond. Assuming none of the contingent actions will be required, the total estimated present worth cost for the Selected Remedy for Ninemile Creek is $13,500,000. The net present worth of 30 years of O&M is $1,500,000. The estimated average annual O&M cost is $120,000. The costs for the contingent actions at removal action sites (Interstate, Success, and Rex) and the treatment pond are:

  - Contingent actions at removal action sites: $16,500,000

  - Treatment pond: $6,000,000

  These actions would be conducted if needed to achieve the benchmarks for Ninemile Creek. Assuming all remedial actions described in the previous section will be necessary to achieve the benchmarks (including contingent actions), the total estimated present worth cost for the Selected Remedy for Ninemile Creek is $36,000,000. The net present worth of 30 years of O&M is $6,000,000. The estimated average annual O&M cost is $480,000.

- Table 12.2-4: Pine Creek. The total estimated present worth cost for the Selected Remedy for Pine Creek is $14,000,000. The net present worth of 30 years of O&M is $2,100,000. The estimated average annual O&M cost is $170,000.

- Table 12.2-5: Canyon Creek. The total estimated present worth cost for the Selected Remedy for Canyon Creek is $35,000,000. The net present worth of 30 years of O&M is $18,000,000. The estimated average annual O&M cost is $1,500,000.

- Table 12.2-6: South Fork. The total estimated present worth cost for the Selected Remedy in the South Fork is $16,000,000. The net present worth of 30 years of O&M is $1,400,000. The estimated average annual O&M cost is $110,000.

- Table 12.2-7: Lead in floodplains. The total estimated present worth cost for the Selected Remedy for lead in the Lower Basin floodplains is $81,000,000. The net present worth of 30 years of O&M is $7,200,000. The estimated average annual O&M cost is $580,000.

- Table 12.2-8: Particulate lead in surface water. The total estimated present worth cost for the Selected Remedy for particulate lead in surface water is $71,000,000. The net present worth of 30 years of O&M is $5,100,000. The estimated average annual O&M cost is $400,000.

The total estimated present worth cost of the Selected Remedy for protection of the environment in the Upper Basin and Lower Basin is $250,000,000, including costs for contingent actions. The total estimated net present worth of 30 years of O&M is $40,000,000. The estimated average annual O&M cost is $3,200,000.

The estimated costs in these detailed cost estimate tables are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost, consistent with RI/FS guidance.

The costs presented are present worth costs. The present worth cost is the sum of the capital costs and the present value of the O&M costs over the period of performance. Consistent with current CERCLA guidance, estimates of O&M present worth costs assume a discount rate of 7 percent and a 30-year period of performance (USEPA 2000b). O&M costs will vary from year to year. The estimated average annual O&M cost was calculated by dividing the net present worth of O&M by the 30-year present worth factor (12.4).

Because the remedial actions have not been staged or phased over time, all capital costs are considered present worth costs assuming year 2000 dollars.[25] The effect of remedy staging over an approximately 30-year implementation period would be to reduce the present worth cost of both capital and O&M costs.

Some components of the remedy are expected to have O&M requirements that extend beyond the assumed 30-year period of performance. The added incremental cost of O&M in perpetuity compared to 30 years of O&M is 15 percent for a 7 percent discount rate. The potential increase of the present worth cost of the remedy resulting from O&M beyond the 30-year performance period is expected to be less than the potential reduction of the present worth cost of the remedy resulting from remedy staging.

[25] The costs in this ROD are based on costs presented in the Feasibility Study (FS), which were developed using year 2000 cost data.

12.2.3 Expected Outcomes of the Selected Remedy

This section describes the expected outcomes of the Selected Remedy in terms of benchmark cleanup criteria, anticipated benefits to human health and the environment, land uses, groundwater uses, and socio-economic and community impacts.

Benchmark Cleanup Criteria

Benchmark cleanup criteria for surface water are based on target levels of fisheries. The benchmark water quality conditions are expressed as multiples of the AWQC, based on the current understanding of the conditions consistent with the targeted fisheries (USEPA 2001d). As fisheries conditions are monitored during and after cleanup, the benchmark cleanup criteria may need to be modified. The benchmark cleanup criteria for dissolved metals in surface water are:

- Tier 1: Migration corridor. Expected to be achieved at dissolved metals[26] concentrations less than 20 times the acute AWQC.

- Tier 2: Resident salmonid fishery of any species. Expected to be achieved at dissolved metals concentrations between 7 times and 10 times the chronic AWQC.

- Tier 3: Resident salmonid fishery with three or more age classes, including young-of-the-year. Expected to be achieved at dissolved metals concentrations between 3 times and 7 times the chronic AWQC.

- Tier 4: Resident salmonid fishery with three or more age classes, including young-of-the-year, and sculpin. Expected to be achieved at dissolved metals concentrations between 1 times and 3 times the chronic AWQC.

- Tier 5: Resident salmonid fishery with five or more age classes, including young-of-the-year, sculpin, and bull trout. Fauna dominated by native species at high densities (0.1 to >0.3 fish per square meter). Least impacted watershed with dissolved metals concentrations less than the chronic AWQC.

The benchmark fisheries tiers are shown in Table 12.2-1.

[26] For the definitions of fisheries tiers, AWQC are equal to the EPA-approved State of Idaho water quality standards for cadmium and zinc (see Tables 8.2-2 and 8.2-3). The concentration ranges are unaffected by the 2001 update to cadmium criteria.

There are no promulgated cleanup criteria or standards that are ARARs for the soil or sediment of the Upper Basin and Lower Basin. Lead is the main risk driver in the soil and sediment and accordingly, EPA has identified lead as the preferred metal to be used as a benchmark. Background lead concentrations in the soil and sediment of the Lower Basin are estimated to be 47.3 mg/kg (see Table 7.2-7), whereas lead concentrations in soil and sediment in the impacted areas are typically 3,500 to 4,000 mg/kg.

To establish a benchmark cleanup criterion for sediment, EPA examined site-specific data and all other available relevant information. For sediment in the wetlands and lateral lakes areas of the Lower Basin, a site-specific lead level of 530 mg/kg has been identified by the USFWS as the LOAEL for waterfowl (Beyer et al. 2000). The USFWS has noted that soil and sediment in 95 percent of the floodplain habitat area the Lower Basin has lead concentrations greater than 530 mg/kg. Using all available lines of evidence, the EcoRA also estimated a range of sediment lead concentrations protective of aquatic birds and mammals. The lead concentrations potentially protective of aquatic birds and mammals include (see also Table 7.2-7):

- 3.65 mg/kg - NOAEL for protection of individuals
- 249 mg/kg - LOAEL for protection of populations
- 718 mg/kg - based on an ED_{20} for populations

Given the absence of promulgated criteria for metals in soil and sediment, EPA made a risk management decision to use the site-specific protective value of 530 mg/kg lead as the benchmark cleanup criterion for the soil and sediment in the Lower Basin. This value is based upon data recently collected in the Coeur d'Alene Basin. It is also within the range of potentially protective values from the literature and other sites. While 530 mg/kg lead in soil/sediment may not be fully protective of aquatic birds and mammals, it will address 95 percent of the habitat area. Only 5 percent of the impacted area in the Lower Basin is estimated to have lead concentrations between 530 mg/kg and background. For these reasons, EPA believes that selection of 530 mg/kg lead as the benchmark cleanup criterion for soil and sediment is technically the best alternative available at this time.

In riparian areas where remedial actions are conducted (e.g., banks and tributaries), risks to riparian receptors will be mitigated using removal and replacement with clean soil or capping with clean soil to isolate contaminants and reduce or eliminate exposure pathways.

It is important to recognize that numerical cleanup criteria for soil and sediment may be revised as additional information becomes available. For example, EPA anticipates conducting studies to evaluate soil and sediment cleanup criteria that are protective of migratory birds in riparian and riverine habitats. As part of this effort, EPA Region 10 and USFWS are currently assessing concentrations in soil and sediment that would be protective of riparian songbirds. Any revisions to criteria would be documented in future decision documents.

A reduction of dissolved metals loads in the Spokane River of approximately 16 percent is estimated to result from implementation of the Selected Remedy. Additional load reductions would result from implementation of remedies in the Box. The estimated reduction needed in high-flow particulate lead load is at least 50 percent to reduce year-round lead concentrations to below chronic AWQC in the Spokane River.

Anticipated Benefits

The remedy selected in this ROD is anticipated to result in significant benefits for protection of the environment, as well as benefits for recreational and subsistence users. Although it would not achieve all long-term goals, it makes a significant step toward achieving those goals. Figure 12.2-15 illustrates the relationship between the Selected Remedy and the long-term remedy that, based on current information, EPA believes is needed for full protection of human health and the environment and compliance with ARARs. Some of the specific benefits anticipated include:

- Providing varying levels of fisheries (adult fisheries, areas capable of supporting spawning and rearing) connected with migratory corridors to allow increased movement between the tributaries and the river. This would include re-establishment of fisheries in Ninemile Creek, improvements of spawning and rearing fisheries in Pine Creek, and improvements in the fisheries, migratory corridors, and water quality in the South Fork and Lower Basin. Figure 12.2-16 shows the benchmarks for improvements in fisheries conditions in the Upper Basin. Table 12.2-2 summarizes the fisheries benchmarks for the Selected Remedy, current water chemistry and physical conditions, and the water chemistry and physical conditions that the Selected Remedy is expected to achieve. The Selected Remedy is not anticipated to provide conditions that would allow re-establishment of the bull trout, which is listed as "threatened" under the ESA.

- A reduction of about 580 pounds per day of dissolved zinc loads from the Upper Basin and Lower Basin (URS 2002b). The reduction in load will result in reduced concentrations of metals in the river system. Figures 12.2-17 and 12.2-18 show the expected values of dissolved zinc concentrations (expressed as multiples of the AWQC) at Pinehurst and Harrison, respectively, after implementation of the Selected Remedy is completed (time = 0 on the graph). A range of concentrations is shown because the effectiveness of remedial actions to be implemented in the Box is not currently known. The expected values of dissolved metals concentrations after implementation of the remedy are consistent with a Tier 1 to Tier 3 fishery in the South Fork at Pinehurst and a Tier 3 fishery in the Coeur d'Alene River at Harrison.

- Additional protection of recreational and subsistence users through cleanup of 31 recreational areas in the Lower Basin.

- An addition of 2,669 acres of safe wetland feeding area and 1,859 acres of safe lake feeding area in the Lower Basin.[27] In these areas soils and sediments with lead exceeding 530 mg/kg would be remediated to provide protection of waterfowl and other birds protected under the MBTA. These actions are expected to result in a reduction in waterfowl mortalities.

- Biostabilization of 33 miles of Coeur d'Alene River bank that is a source of particulate lead to reduce downstream lead loading and recontamination. This action would include cleanup of the adjacent riparian zone, thereby providing additional safe habitat for ecological receptors and additional protection for recreational and subsistence users.

- Cleanup of riparian habitat, including riparian buffer zones along an estimated 33 miles of the Coeur d'Alene River in the Lower Basin; 1.7 miles of East Fork Ninemile Creek, 2.6 miles of East Fork Pine Creek; riparian areas within or adjacent to Thompson Lake, Thompson Marsh, Anderson Lake, Cave Lake, Bare Marsh, Medicine Lake, and Lane Marsh; and oases of riparian habitat at streamside removal areas along the South Fork. The cleanup would provide safe habitat for birds protected under the MBTA and other riparian zone plants and animals.

- Removal of 1,300,000 cy of river bed sediments from natural depositional areas over the duration of the Selected Remedy to reduce downstream lead loading and recontamination. This 1,300,000 cy represents 6 percent of the 20,500,000 cy of contaminated river bed sediments in the Lower Basin.

- Improvements to water quality conditions in the Spokane River. Based on probabilistic modeling and current estimates of remedy effectiveness, the Selected Remedy is anticipated to reduce the dissolved metals load in the Coeur d'Alene River at Harrison by approximately 16 percent. Assuming a consistent rate of dissolved metals retention in Coeur d'Alene Lake, it is anticipated that implementation of the Selected Remedy would result in a reduction of dissolved metals loads in the Spokane River of approximately 16 percent. Additional reductions of dissolved metals load would occur as a result of remedial actions

[27] The acres of lake area shown are the entire areas of the lakes. To develop estimated costs, it is anticipated contaminated sediments will be cleaned up to a water depth of six feet (which represents an average of approximately 25 percent of the total lake area). These water depths represent the highest use feeding areas and, consequently, the areas of greatest exposure to waterfowl and other animals.

that have been implemented within the Box, as well as future Phase 2 remedial actions within the Box.

Available Land Uses

Most of the area addressed by the Selected Remedy consists of riparian, wetland, and lake habitat within the 100-year floodplain in the Lower Basin and remote sites and areas within the 100-year floodplain in the Upper Basin. The anticipated future land uses in these areas are wildlife habitat, recreational use, and subsistence use.

Some former mine and mill sites within the Upper Basin that are not within the 100-year floodplain have the potential for redevelopment for commercial or residential use. At sites where contaminated materials are left on site, institutional controls would be required to manage potential exposures and maintain the integrity of the remedy. Institutional controls to prevent development of groundwater as a drinking water source would be needed at most sites. Institutional controls will be needed in the Upper Basin and Lower Basin to ensure the continued effectiveness of the Selected Remedy and to prevent land uses that are inconsistent with the level of protection achieved by the Selected Remedy. These institutional controls could include:

- Physical measures, such as fences and signs, to limit activities that may interfere with the cleanup action or result in exposure to hazardous substances at the site

- Legal and administrative controls, such as zoning restrictions, environmental protection easements, restrictive covenants, or equitable servitudes used to ensure such measures are maintained

Implementation of the Selected Remedy will require some land for management of waste materials that are generated by the cleanup activities. Management of waste materials is discussed in Section 12.5.

Available Groundwater Uses

The Selected Remedy does not address groundwater use. It is not anticipated that additional available uses of groundwater would result from implementation of the Selected Remedy.

Socio-Economic and Community Impacts

Implementation of the Selected Remedy is expected to improve the socio-economic conditions of the Coeur d'Alene Basin. The elements of the remedy focusing on water quality improvements and the subsequent increase in fish populations and diversity will likely expand the recreational use of this resource. Remediation of the riverbanks will slow erosion and improve the riparian

corridor for greater recreational use. Cleanup of easily accessible abandoned mine sites will allow redevelopment of these properties and increase tax revenues. The work associated with implementation of the Selected Remedy may provide additional jobs for the local labor force and contractors. The long duration of the work should encourage investment in training and development of the local labor force to establish the necessary skills and expertise that can pay off for the workers and contractors for many years. This should result in growth of the tax base for local economic benefit. The work may also provide opportunities for local supply contractors. Additionally, remediation dollars spent in the Silver Valley may create other opportunities for local businesses.

12.3 COEUR D'ALENE LAKE

Coeur d'Alene Lake is not included in the Selected Remedy. State, tribal, federal, and local governments are currently in the process of implementing a lake management plan outside of the Superfund process using separate regulatory authorities.

The sediments at the bottom of the lake contain mining contamination, and the rate of release of metals in the sediments into the water column could increase if the lake water quality deteriorates due to nutrient enrichment. Currently, however, more metals enter the lake annually from the Coeur d'Alene River than flow out of the lake into the Spokane River. This and other information indicate that the lake sediments are a smaller source than riverine inputs. Based on currently available information, active remediation (e.g., removal, capping) of lakebed sediments is not warranted.

The lake management plan would focus on reducing riverine inputs of metals and nutrients that continue to contribute to contamination of the lake and the Spokane River. Activities included in the plan are (Coeur d'Alene Tribe, et al. 1996):

- Best management practices to control erosion from littoral areas of the lake and watersheds that feed the lake
- Residential and municipal sewer systems improvements to reduce nutrient loadings entering the lake from these sources
- Where necessary, upgrading of municipal water treatment plants to reduce nutrient contributions to the lake
- Bank stabilization to reduce erosion of river banks. Establishment of "no wake" zones has also been suggested to reduce erosion of river banks

The Coeur d'Alene Tribe, IDEQ, and EPA, along with others, plan to coordinate a comprehensive lake monitoring program to evaluate the effects of upstream cleanup, potential sources of contamination, and potential impacts to the lake and the Spokane River. If conditions change or new information that modifies the current understanding becomes available, additional actions will be evaluated. Evaluation of lake conditions will be included in the five-year review process.

Some questions have been raised regarding the need to further evaluate potential risks to humans who eat whole fish or fillets taken from fish in the lake. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake, and only a limited number of fillets were sampled. As a result, some uncertainty remains about the potential risks resulting from eating fish from the lake. Additional fish sampling was conducted in 2002, and results of the sampling should be available in early 2003.

12.4 SPOKANE RIVER

Cleanup of community and residential areas, including the identified recreational areas, to minimize human health exposure is a top priority. For the Spokane River in Idaho, the Selected Remedy does not include any remedial actions. The beaches and wading areas adjacent to the Idaho portion of the Spokane River were sampled in 1998 and were found to be safe; i.e., concentrations of metals did not exceed risk-based levels for recreation.

At present, the risks to persons, including Spokane tribal members, and others who may practice a subsistence lifestyle in the Spokane River area have not been quantified. EPA and the Spokane Tribe are cooperating in planning additional testing and studies that will be implemented to evaluate the potential exposures to subsistence users. The results of those tests and studies will determine appropriate future response actions to be taken, if any.

For the Spokane River in Washington, the Selected Remedy includes all of the remedy for protection of human health upstream of Upriver Dam and protection of the environment between the Washington/Idaho state line and Upriver Dam. The Selected Remedy consists of a combination of access controls, capping, and removals from Spokane River Alternatives 3, 4, and 5. This remedy was also the Preferred Alternative in the Proposed Plan.

The Selected Remedy for the Spokane River is summarized in Table 12.4-1.

12.4.1 Description

For the Washington portion of the Spokane River, a limited number of sediment and soil sites in and adjacent to the Spokane River have been identified for cleanup on the basis of potential

human and ecological exposures. The sites are located along a 16-mile reach of the river between the Idaho/Washington state line and Upriver Dam, which is upstream of the city of Spokane. The identified areas include 10 shoreline sites and a subaqueous site where contaminated sediments have accumulated directly behind Upriver Dam. The areas are shown in Figure 12.4-1.

The Selected Remedy to protect human health and the environment at these areas draws from Spokane River Alternatives 3, 4, and 5. The Selected Remedy includes a combination of access controls, capping, and removals for the shoreline sites.

The remedy for the contaminated sediments behind Upriver Dam will be established following further study and engineering evaluation. Dredging or capping are the options anticipated for sediments behind the dam. The sediments behind the dam are contaminated with PCBs, in addition to metals. The PCBs are currently being investigated under the State of Washington MTCA. The Washington State Department of Ecology (Ecology) is working with the responsible parties to conduct a RI/FS of the sediment behind the dam. EPA and Ecology intend to coordinate remediation to minimize unnecessary duplication and cost.

There is some potential for recontamination of the shoreline cleanup sites. Fine-grained, metal-rich sediments coming from the Coeur d'Alene River Basin and metal-rich sediments previously deposited along the upper river may come to rest on remediated locations. Because of this concern, a phased approach may be used. The locations initially remediated can be monitored for recontamination and cleanup work modified as necessary. If recontamination is a problem, the location involved may undergo periodic follow-up contaminant removal or maintenance of the clean-soil cover.

Other actions along the Spokane River include water-quality monitoring, aquatic-life monitoring, remedial-performance monitoring of sediments, and contingencies for additional or follow-up cleanups. Other than the cleanup actions for impacted shorelines and sediments, measurable improvements to water quality in the river must rely primarily on actions performed upstream. Thus, the degree and duration of potential recontamination and the measurement of improvements to ambient surface-water quality will be closely tied to the pace and scope of the cleanup actions in the Lower Basin and Upper Basin, as well as to the long-term retention of metals in Coeur d'Alene Lake sediments. As described in Section 12.2.3 Anticipated Benefits, a reduction of dissolved metals loads of approximately 16 percent is anticipated to result from implementation of the Selected Remedy.

12.4.2 Estimated Remedy Costs

The estimated remedy costs for the Spokane River are summarized in Table 12.4-1. A range of estimated costs was developed. The lower range was developed based on capping of

contaminated sediments. The upper range was developed based on excavation and disposal of contaminated sediments. The lower range total estimated present worth cost is $4,500,000 with a net present worth of 30 years of O&M of $1,400,000. The estimated average annual O&M cost is $110,000. The upper range total estimated present worth cost is $11,000,000 with a net present worth of 30 years of O&M of $1,300,000. The estimated average annual O&M cost is $100,000.

The estimated costs in this table are based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost, consistent with RI/FS guidance.

The costs presented are present worth costs. The present worth cost is the sum of the capital costs and the present value of the O&M costs over the period of performance. Consistent with current CERCLA guidance, estimates of O&M present worth costs assume a discount rate of 7 percent and a 30-year period of performance (USEPA 2000b). O&M costs will vary from year to year. The estimated average annual O&M cost was calculated by dividing the net present worth of O&M by the 30-year present worth factor (12.4).

Because the remedial actions have not been staged or phased over time, all capital costs are considered present worth costs assuming year 2000 dollars.[28] The effect of remedy staging over an approximately 30-year implementation period would be to reduce the present worth cost of both capital and O&M costs.

Some components of the remedy may have O&M requirements that extend beyond the assumed 30-year period of performance. The added incremental cost of O&M in perpetuity compared to 30 years of O&M is 15 percent for a 7 percent discount rate. The potential increase of the present worth cost of the remedy resulting from O&M beyond the 30-year performance period is expected to be less than the potential reduction of the present worth cost of the remedy resulting from remedy staging.

12.4.3 Expected Outcomes of Selected Remedy

This section describes the expected outcomes of the Selected Remedy in terms of cleanup levels and residual risks, land uses, groundwater uses, and socio-economic and community impacts.

[28] The costs in this ROD are based on costs presented in the Feasibility Study (FS), which were developed using year 2000 cost data.

Cleanup Levels and Residual Risks

The sediment lead cleanup level is 700 mg/kg for recreational use. For children's exposure to lead, it was assumed that 92 percent of the total exposure occurs at the home and 8 percent occurs during recreation. The total exposure was established such that the probability is 5 percent or less of a typical child having a blood lead level exceeding 10 μg/dL and 1 percent or less of a typical child having a blood lead level exceeding 15 μg/dL. The sediment cleanup level will reduce children's exposure to lead such that the recreational component of the total lead exposure is not exceeded. The 10 shoreline sites shown in Figure 12.4-1 exceed State of Washington regulations for cleanup standards, as defined in WAC 173-340-740, for protection of human health based on lead or arsenic risk-based concentrations. Critical ecological habitat goals will be addressed concurrently with the human health actions in those areas where they are co-located.

Sediments accumulated behind Upriver Dam will be cleaned up to levels that will not pose an unacceptable risk to aquatic organisms and will reduce to acceptable levels the potential for exposure of recreational users to contaminated sediment resulting from mobilization and redeposition of the contaminated sediments in areas downstream of the dam.

Cleanup of critical habitat areas identified by Ecology will reduce risks to waterfowl and other ecological receptors to generally safe levels. The critical habitat areas identified by Ecology are:

- CUA201 (Star Rd)
- DA06/07/08 (Island Complex)
- DA10 (Murray Rd)
- CUA202 (Harvard Rd, N Bank)

Implementation of the Selected Remedy for the Spokane River is not anticipated to result in significant reductions of metals concentrations in surface water, which will be closely tied to the pace and scope of the cleanup actions in the Lower Basin and Upper Basin, as well as the long-term retention of metals in Coeur d'Alene Lake sediments.

Land Uses

The anticipated future land uses of the shoreline and sediment depositional areas addressed by the Selected Remedy are wildlife habitat, recreational use, and subsistence use. Future commercial or residential use is not anticipated.

Groundwater Uses

The Spokane Valley aquifer is a designated "sole source" aquifer. The aquifer is recharged, in part, by surface water from the upper Spokane River; however, use of groundwater is not limited by the presence of metals. Therefore, the remedy does not address potential future groundwater use. The concentrations of metals in Spokane River water are well below drinking water standards. In addition, a surface water groundwater interaction study in the upper Spokane River indicated that dissolved metals entering the aquifer from the river in this area are not migrating far beyond the river bank or are being diluted by aquifer water (Marti and Garrigues 2001).

Socio-Economic and Community Impacts

Implementation of the remedy will reduce the potential for exposure to metals at beach and shoreline recreational areas and may enhance human uses of ecological resources. It is anticipated the Upper Spokane River health advisory regarding ingestion of beach and shoreline sediments could be lifted. There is also a fish consumption health advisory for the Spokane River from the state line to Nine Mile Dam. It is likely that lead concentrations in whole fish will not decline substantially until the amount of lead that reaches the Spokane River from upstream sources in reduced. These reductions will be closely tied to the pace and scope of the cleanup actions in the Lower Basin and Upper Basin, as well as the long-term retention of metals in Coeur d'Alene Lake sediments.

12.5 SITING AND DESIGN OF REPOSITORIES FOR MATERIAL GENERATED BY CLEANUP ACTIVITY

Implementation of the remedy will require construction of repositories for disposal of metals-contaminated soils, sediments, debris, and treatment residuals. All disposal locations will be evaluated using the same process and criteria. All locations will also be subject to long-term institutional controls and monitoring (if necessary) to ensure the integrity of the remedy.

Waste consolidation areas designed and constructed in the Coeur d'Alene Basin pursuant to this ROD will only be able to receive material generated by the cleanup activity associated with the Selected Remedy in this ROD, including material generated through the Basin Institutional Controls Program and related CERCLA removals in the Basin. This material will include soils, house dust, debris, alluvial and fluvial soils, and sediment contaminated by mining extraction and beneficiation waste released from historic mining facilities in the Coeur d'Alene Basin. This material, along with tailings and waste rock that may be consolidated in repositories as well, is exempt from Resource Conservation and Recovery Act (RCRA) Subtitle C hazardous waste management requirements pursuant to the Bevill Amendment (42 U.S.C. §6921(b)(3)(A)(ii). Repositories constructed pursuant to this ROD will be designed to reliably contain waste

material and prevent the release of contaminants to surface water, groundwater, or air in concentrations that would exceed state and/or federal standards.

Principal threat wastes (such as metal concentrates) and non-Bevill-exempt hazardous waste will be disposed of at an off-site facility or may be disposed of on-site with additional treatment and/or additional engineering measures. Treatment may consist of stabilization of waste materials. Engineering measures may consist of construction of an enhanced cap to prevent leaching or a lined principal threat materials cell to contain highly concentrated and/or highly mobile material.

A four-step process will generally be used to evaluate potential repository locations and specify design requirements.

1. Site Identification. A list of potential repository sites will be prepared in conjunction with other Basin stakeholders. Additional locations will be identified where local governments and/or property owners have an interest in receiving material generated from cleanup actions.

2. Technical Evaluation. Potential repository sites will be evaluated using site-specific data and the repository location and design guidelines described below.

Repositories will be located and designed to:

- Prevent adverse human health or ecological impacts and result in improvements wherever possible
- Prevent additional groundwater and/or surface water impacts
- Integrate with past or nearby cleanup efforts
- Comply with all ARARs
- Be appropriate for the characteristics of the waste that will be disposed of there
- Be cost-effective
- Minimize long-term operation and maintenance (O&M) costs

Additional considerations include:

- Transportation impacts and costs

- Economic development or future reuse of the site where feasible
- Absence or presence of mining-related contaminants
- Geotechnical stability
- Availability of clean cover material
- Community acceptance

3. Public Input/Notification. Concurrent with the technical evaluation, a public outreach effort will be initiated. Affected citizens and stakeholders will be given an opportunity to comment on the proposed repository location and design.

4. Decision Documentation. Upon completion of the public outreach efforts, remedial design documents will be prepared that include, but are not limited to, the following issues for each repository:

- Rationale for Repository Selection. For example:
  - Evaluation of repository location with respect to surrounding environmental conditions
  - A summary of public outreach efforts
- Design Requirements and Rationale. For example:
  - Description of selected cover system (or systems if multiple cells) and liner/leachate collection requirements, if any
  - Construction configuration and ultimate final grading and geometry of repository including stormwater management and terracing
  - Results of hydrogeologic and hydrologic modeling/characterization of the cover system and repository and surrounding environment
  - Special considerations, if any, due to repository location such as proximity to floodplain or surface water bodies or geotechnical concerns

  - Identification and rationale for compliance with any applicable or relevant and appropriate requirements as well as any other guidance identified as "To Be Considered" as outlined in Section 12 of this ROD

- General Operating Requirements During Remedial Action. For example:

  - Standard operating procedures for site including hours of operation, site access, dust control, decontamination, and record-keeping requirements

  - Waste acceptance criteria including allowable chemical concentrations, moisture content, percent allowable debris, and dimensions of material

  - Sampling requirements for characterization of incoming waste

  - Any pretreatment requirements (e.g., stabilization, de-watering) prior to waste disposal

  - Waste placement requirements including lift thickness and compaction requirements

- Post-Closure O&M Requirements. For example:

  - Post-closure monitoring of groundwater and surface water runoff
  - Institutional controls and limitations on future land use
  - Maintenance plan for the final cover

It is not known, at this point in time, how many repositories will be needed to support the Selected Remedy in this ROD. The estimated volumes of material that may require excavation and disposal are about 500,000 to 900,000 cy in the Upper Basin and about 2,600,000 cy in the Lower Basin (including approximately 1,300,000 cy of river bed sediments, 500,000 cy of river bank and splay material, and 800,000 cy of wetland and lateral lake sediment). By comparison, there are currently about 2,100,000 cy of tailings in the Hecla-Star Tailings Ponds in lower Canyon Creek and about 26,000,000 cy of waste material in the Central Impoundment Area. Exact repository locations and design requirements will be developed, with community input, using the four-step process outlined above.

Where there are two or more noncontiguous contaminated areas that are reasonably related on the basis of geography, or on the basis of the threat, or potential threat, to the public health or welfare or the environment, CERCLA section 104(d)(4) and the preamble to the NCP (40 CFR 8690) allows EPA to treat these related areas as one area of contamination (AOC) for response purposes and, therefore, allows the lead agency to manage waste transferred between such

noncontiguous areas without having to obtain a permit. Within the Coeur d'Alene Basin, the repositories and material generated by the cleanup activity associated with the Selected Remedy in this ROD will be related on both the basis of geography and on the basis of the threat to public health or welfare and the environment. In addition, these wastes will be compatible with the selected disposal approach in the repositories. Thus, consolidation of these wastes in a repository will not require permits even if the waste site and repository location are determined to be noncontiguous.

No lakes will be sacrificed as repositories. However, some cleanup projects may involve consolidation and capping of contaminated materials within a wetland or lake area to reduce ecological impacts (e.g., subaqueous capping). Other projects may involve the consolidation and stabilization of contaminated sediments and river bank material. Remedies that involve consolidation and capping of materials "in place" are not subject to the same siting requirements as remedies that involve removing material from one location and consolidation of that material in a repository.

12.6 MONITORING AND ADDITIONAL DATA NEEDS

EPA is currently working with Coeur d'Alene Basin stakeholders to collaboratively develop a Basin environmental monitoring program. Organizations involved with EPA in development of the monitoring program include IDEQ, Ecology, CDA Tribe, Spokane Tribe, USFWS, USGS, and BLM. The aforementioned parties were involved in the development of the remedy identified in this ROD and are knowledgeable about the remedy, Basin conditions, and monitoring needs. The program will be established as part of the Selected Remedy and is critical to the successful implementation and evaluation of the remedy.

The primary goals of the human health monitoring activities will be to evaluate the effectiveness of remedial actions in the residential and community areas and provide data for EPA to conduct CERCLA-required five-year reviews of the progress made on remedy implementation. For example, soil sampling will be conducted to document post-cleanup concentrations of lead and arsenic, and drinking water monitoring will be conducted for those homes on contaminated private wells that are not connected to public drinking water systems due to annexation and engineering issues (e.g., homes where point-of-use treatment is implemented).

The key goals of the environmental monitoring program will be to evaluate the effectiveness of remedial actions, evaluate progress toward achievement of benchmarks, and gain a better understanding of Basin processes and data variability. The monitoring will also provide data for EPA to conduct future CERCLA-required five-year reviews of progress on remedy implementation. Five-year reviews will need to address the progress toward achieving the ecological focuses for remedial action (e.g., dissolved zinc and cadmium in surface water,

particulate lead in surface water, and lead in flood plain soils and sediments) and progress toward the benchmarks (see Table 12.2-1). To the extent feasible, the long-term monitoring is expected to integrate with monitoring conducted by other entities (e.g., IDEQ, Ecology, USGS, etc.) as part of other program requirements. Given the scope of the project, the long time frame, and difficult budget forecasts, every effort will be made to ensure that the monitoring be effective, streamlined and targeted to answer key questions.

The environmental monitoring program is envisioned to have two main components. The first component would provide an overarching status and trends assessment of the surface water, soil, sediment, and biological resources conditions in the Basin. The status and trends monitoring is expected to continue for many years, but would be implemented at a manageable frequency and intensity. Some monitoring parameters may be triggered by events (e.g., high flow events may trigger flood plain sediment monitoring). Other monitoring may occur on a periodic frequency (e.g., quarterly, annually, once every five years, etc.) and at locations which represent key nodes or points of significant chemical or ecological importance. The monitoring is anticipated to have surface water, soil/sediment, and biological aspects. Since groundwater is not addressed in this ROD, groundwater monitoring will likely be limited to the situations in which groundwater data is needed to address specific surface water questions.

The second component of the monitoring program is action-specific monitoring which will be linked with the overarching status and trends monitoring program. The remedial action-specific effectiveness monitoring will be developed as part of the design of each remedial action.

The basin-wide status and trends environmental monitoring program, as well as the remedial action-specific effectiveness monitoring, will be structured to provide data needed to evaluate the following issues:

Trends in dissolved zinc and cadmium concentrations in surface water

- Trends in particulate lead loads and concentrations in surface water
- Trends in lead concentrations in the flood plain soils/sediment, levees, and river bed sediment
- Progress toward achieving the benchmarks of the Selected Remedy
- Potential unwanted impacts to the system (e.g., recontamination, nutrient loading, excess sedimentation, etc.) resulting from implementation of the remedy
- Changes or trends in biotic benchmarks (e.g., population/diversity, chemical exposure, bioavailability, etc.)

- Trends in water quality, sediments, and biological resources in Coeur d'Alene Lake

- Trends in groundwater quality, where appropriate to evaluate impacts to surface water

In addition to monitoring needs, EPA recognizes that some areas of the Basin have not been fully characterized, and additional data collection will be needed. These efforts will include:

- Metals loading sources and pathways in the South Fork from Wallace to Pinehurst, focused on the Bunker Hill Box and Osburn areas, including the contribution of metals sorbed/precipitated within aquifer as a limiting factor to the effectiveness of sediment removals

- The dissolved metals loads originating from the reach from the confluence of the North Fork and South Fork to Cataldo and from the Mission Flats dredge spoils area

- The relative magnitude of lead loads originating from the beds and banks in the Lower Basin

- Recontamination potential of various Lower Basin areas

- Identification of long-term metals flux from Coeur d'Alene Lake

- Identification of cleanup criteria for ecological receptors, including risks to songbirds in riparian habitats

- Characterization of metals loading to groundwater and surface water from the Hecla-Star Tailings Ponds

- Additional testing and studies to evaluate the potential exposures to subsistence users by resources in and along the Spokane River on the Spokane Indian Reservation

12.7 STATE AND TRIBE ACCEPTANCE

This section evaluates state, tribe, and natural resource trustee acceptance of the Selected Remedy based on comments on the Proposed Plan submitted by the States of Idaho and Washington, the Coeur d'Alene and Spokane Tribes, and the Departments of the Interior and Agriculture. The statements included in Sections 12.7.1 through 12.7.6 were compiled by EPA

from submittals of the entity referenced in each section heading and reflect the views of the entity. The full comments submitted by these entities, and EPA's responses to these comments, are presented in the Responsiveness Summary (Part 3 of this ROD).

For issuance of this ROD, EPA sought formal concurrence from states and tribes only within their individual jurisdictional boundaries. Because no remedial actions have been selected that would be implemented within the jurisdictional boundaries of the Spokane Tribe, EPA did not seek to obtain formal concurrence from the Spokane Tribe. However, EPA recognizes the concerns of the tribes with respect to contamination within traditional cultural areas that are not within their jurisdictional boundaries. In addition, EPA recognizes the concerns of the State of Washington with respect to contamination entering the state through the Spokane River.

12.7.1 State of Idaho Acceptance

As it pertains to work in Idaho, the State of Idaho generally concurs with the Selected Remedy and agrees with the majority of the final ROD.

Idaho is opposed, however, to *any* identification of the Lake as part of a "Superfund site" and will pursue administrative actions to make clear that the Lake is not presently nor in the future *ever* identified as part of a "CERCLA site." The Sate of Idaho has similar concerns about including the Idaho portion of the Spokane River where no remedial actions are identified. The State believes that the Lake Management Plan process for the Lake and state and local management mechanisms for the Idaho portion of the Spokane River will provide the appropriate level of protection to maintain water quality.

The State of Idaho does not believe it is reasonable to speculate in the ROD about the cleanup work after implementation of the Selected Remedy. Prediction of the environmental situation 30 years into the future is impossible given the unknowns about the effectiveness of remedial actions and natural attenuation. The State believes that, after full implementation of the Selected Remedy, environmental conditions must be evaluated and a determination made as to whether "Applicable or Relevant and Appropriate Requirements" (ARARs) in place at that time have been met or if waivers will be applied.

Idaho supports the continued development and implementation of innovative treatment technologies. Idaho supports the adaptive approach outlined in the ROD to take advantage of new information and technologies.

Idaho insists on and appreciates EPA's support of the Basin Environmental Improvement Commission as the implementing entity for the ROD.

Idaho believes that there is no health emergency of any kind in the Basin, but there are prudent voluntary measures to take to assure that individuals are not exposed to contaminants.

Idaho is concerned that removal actions be accomplished in a manner that does not contribute to additional contamination or disrupt viable ecosystems that currently exist. Idaho's support for the Selected Remedy is conditional upon its implementation not impacting the rapid completion of the Phase I and Phase II actions in the "Box" and subsequent deletion actions.

12.7.2 State of Washington Acceptance

While the State of Washington (the State) believes that the Selected Remedy will make progress towards protection of human health and the environment, the State continues to have concerns about the scope of the Selected Remedy in Idaho. The State believes additional measures should have been identified as part of the remedy.

The State believes that measurable water quality improvements in the Spokane River can be achieved or selected ambient water quality criteria (AWQC) reached if EPA and Idaho were to establish water quality improvements in the river as a primary interim remedial objective. The State sought assurances for a remedy cleanup level that would assure at least a 20 percent reduction in the annual zinc load to the Spokane River, along with achieving total and dissolved lead AWQC during winter melt or spring runoff events. The State believes these goals are feasible and justified and could be achieved under an appropriately scoped interim remedy along with deliberate actions in the Bunker Hill Box. In particular, the State continues to seek additional or enhanced actions to reduce metals loads in the following areas:

- Canyon Creek. The State continues to seek assurances that the anticipated passive treatment systems will not be built unless there is a clear indication they will perform over the long term and represent the best available technology. If the passive systems are not feasible, if system designs cannot be assured to perform in a desired fashion or to meet performance goals, then conventional active treatment system aspects should be incorporated and applied.

- Bunker Hill Box. The State continues to seek commitments from the EPA and Idaho to pursue vigorous remedies in the Bunker Hill Box with the objective of significantly reducing dissolved metals reaching surface water and also to assure the central treatment plant (CTP) is upgraded (avoiding potential catastrophic releases of metals to the South Fork). Thus, treatment or management of groundwater impacting the South Fork should clearly be a basin priority, aspects of which might also potentially be integrated with the CTP reconstruction.

- Mission Flats. The State believes the ROD should clearly include a hydrogeologic evaluation followed by the design and construction of passive or active hydraulic/water quality remedial actions to reduce dissolved metals loading to the Coeur d'Alene River from the dredge spoils at this location.

- Lower Coeur d'Alene River bed sediments. The State concurs that the Dudley reach should be prioritized as part of the first increment of remedial action defined in this remedy. The State strongly supports the increase in riverbed sediment remediation defined in Section 14.0 and appreciates EPA's response to Washington's citizen concerns. However, the State believes the sediment removal actions included in the selected remedy are inadequate to definitely assure long-term, permanent protection of the Spokane River.

- Lake Coeur d'Alene. The State believes EPA should apply all available regulatory and legal authorities to assure implementation of measures to protect water quality in the lake and minimize future releases of metals from the lake. The State believes that for the Lake Management Plan to be successful it must have the long-term financial and regulatory support of the associated local, state, tribal, and federal entities in Idaho.

12.7.3 Coeur d'Alene Tribe Acceptance

The Coeur d'Alene Tribe generally supports the Selected Remedy, but has identified areas of concern.

The tribe does not believe that adequate levels of protectiveness will be achieved once the ROD is implemented. Other concerns identified by the tribe include:

- The Tribe believes the Selected Remedy does not address the risks to recreational and subsistence users in the Upper Basin and Lower Basin.

- The Tribe recognizes that additional cleanup actions will be evaluated during and after implementation of the Selected Remedy, but is concerned that the overall protectiveness and long-term effectiveness of these actions cannot be evaluated.

- The Tribe is also concerned that the Selected Remedy identifies no sources of funding for implementation of the Lake Management Plan. The Tribe believes the Lake Management Plan should be implemented under CERCLA authorities and be fully funded as an institutional control under CERCLA.

- The Tribe expects CERCLA funding to continue monitoring in Coeur d'Alene Lake.

12.7.4 Spokane Tribe Acceptance

- The Spokane Tribe generally supports the cleanup activities included in the Selected Remedy. The Spokane Tribe believes, however, that the Selected Remedy does not maximize the protection of human health and the environment, and that additional measures should be implemented during the term of the remedy's first increment.

- The Tribe believes the Selected Remedy incorporates too many uncertainties and leaves too many things undone for ARARs to be complied with and human health and the environment protected. The Tribe believes the time frame contemplated under the Selected Remedy for achieving ARARs is excessive, and that more cleanup work should be conducted now.

- The Tribe does not believe the Selected Remedy provides adequate protection of current and future subsistence users who reside and/or practice subsistence lifestyles within or near areas scheduled for remediation. Additional testing and studies to evaluate the potential exposures to subsistence users by resources in and along the Spokane River on the Spokane Indian Reservation are necessary. Threats to human health and the environment identified by those tests and studies should be addressed by future response actions.

- The Tribe believes that EPA's future involvement in the management of Lake Coeur d'Alene is legally necessary to ensure the long-term enforceability of the Lake Management Plan.

- The Tribe believes that EPA's approach of employing different remediation goals based on protection of different uses (e.g., beach goers versus subsistence users) within different political boundaries will not result in the necessary reduction of cumulative risk to downstream interests.

- Section 13.2 outlines ARARs and TBCs for this Selected Remedy. Future evaluations may find threats to the environment and the health of subsistence users by resources in and along the Spokane River on the Spokane Indian Reservation, in which case additional ARARs may be identified as appropriate response actions are considered.

12.7.5 Department of Interior

The Department of Interior (DOI) is concerned that species protected under the ESA and MBTA will not be fully addressed once the ROD is implemented. Other concerns identified by the DOI include:

- The DOI would like EPA to select Alternative 3 (at a minimum) and possibly Alternative 4 (for some areas) as the Selected Remedy for this ROD.
- The DOI would like all contaminated wetlands and lakes to be addressed.
- The DOI is concerned that the remedy is not protective of riparian wildlife.
- The ROD should include language recognizing that work by others may be conducted consistent with the long-term goals of the remedy.

12.7.6 Department of Agriculture

The Department of Agriculture generally concurs with the Selected Remedy, but has identified the following areas of concern:

- The interim response action is only a first phase of the necessary actions and as such, USDA would like EPA to continue to pursue Alternative 3 remedial actions as the final remedy for the basin.
- The ROD should include language recognizing that work by others may be conducted consistent with the long-term goals of the remedy.
- Cleanup actions and their effectiveness are iterative processes and, as such, continued coordination with the Natural Resource Trustees and others needs to be maintained.

12.8 COMMUNITY ACCEPTANCE

EPA's work in the Coeur d'Alene Basin has been the subject of considerable controversy and scrutiny. Given the large geographic area encompassed by the study and cleanup activities, community concerns are numerous and wide-ranging. Public opinion has been sharply divided about such overarching issues as whether cleanup is needed in the Basin, how much cleanup is needed, who should be in charge of the cleanup, and the boundaries of the Superfund designation.

EPA led a collaborative process in developing the Proposed Plan and ROD. All of the regulatory and land management agencies with jurisdiction in the Basin have been "at the table" for more than four years and have been directly involved in shaping the cleanup plan. In addition, EPA coordinated an extensive community involvement program that included four public comment periods on draft documents prior to the release of the Proposed Plan, participating in more than 200 meetings in a three-year period, monthly newsletter updates, and hiring a local community liaison (a more detailed description of community involvement activities can be found in Section 3). By engaging the public and regulatory stakeholders early during the RI/FS and providing opportunities for input far beyond those required by CERCLA, EPA has been able to respond to issues and concerns in "real time" as the cleanup plan was being developed.

During the comment period on the Proposed Plan, EPA received more than 1,300 individual submissions that contained a total of more than 3,300 separate comments. EPA has responded to each individual comment and has provided a summary of the major comments and responses. Both the general and detailed comments and responses can be found in Part 3 of this ROD.

As with the four earlier comment periods, a broad range of opinions was represented in the public comments on the Proposed Plan. Many comments were very general and expressed lack of support for EPA and other government agencies or expressed the belief that no cleanup is needed in the Basin. Other comments either generally supported EPA's plan or expressed a desire for a more aggressive cleanup approach. In developing the Selected Remedy, EPA has attempted to strike a balance between addressing community and stakeholder concerns and meeting its legal obligations under CERCLA. Below is a brief summary of the major community concerns expressed during the comment period for the Proposed Plan.

- Some people continued to express concern about the way the State of Idaho and EPA assessed the human health risks in the Basin and believe that the risks have been overestimated. Many of these people therefore believe that residential cleanups in the Upper Basin are not necessary.

- Some people believe that the risks to the environment have been overestimated, or they believe that the Basin environment should be allowed to recover on its own without any active cleanup work.

- Some people expressed concern about the boundaries of the Superfund site and EPA's plan to "expand" the cleanup in the Basin. Many of these people are concerned that the stigma associated with Superfund sites stands in the way of economic progress in the Basin.

- Many people expressed a desire for state and local governments to have a major role in making cleanup decisions.

- Some people were concerned about how long cleanup will take and EPA's proposed "incremental approach." These people were concerned that the incremental approach provides no certainty about when the cleanup will be finished and when the Superfund designation can be removed from the Basin.

- Many people in Washington State and some in Idaho felt that the cleanup plan should be more aggressive in order to be more protective of human health and the environment.

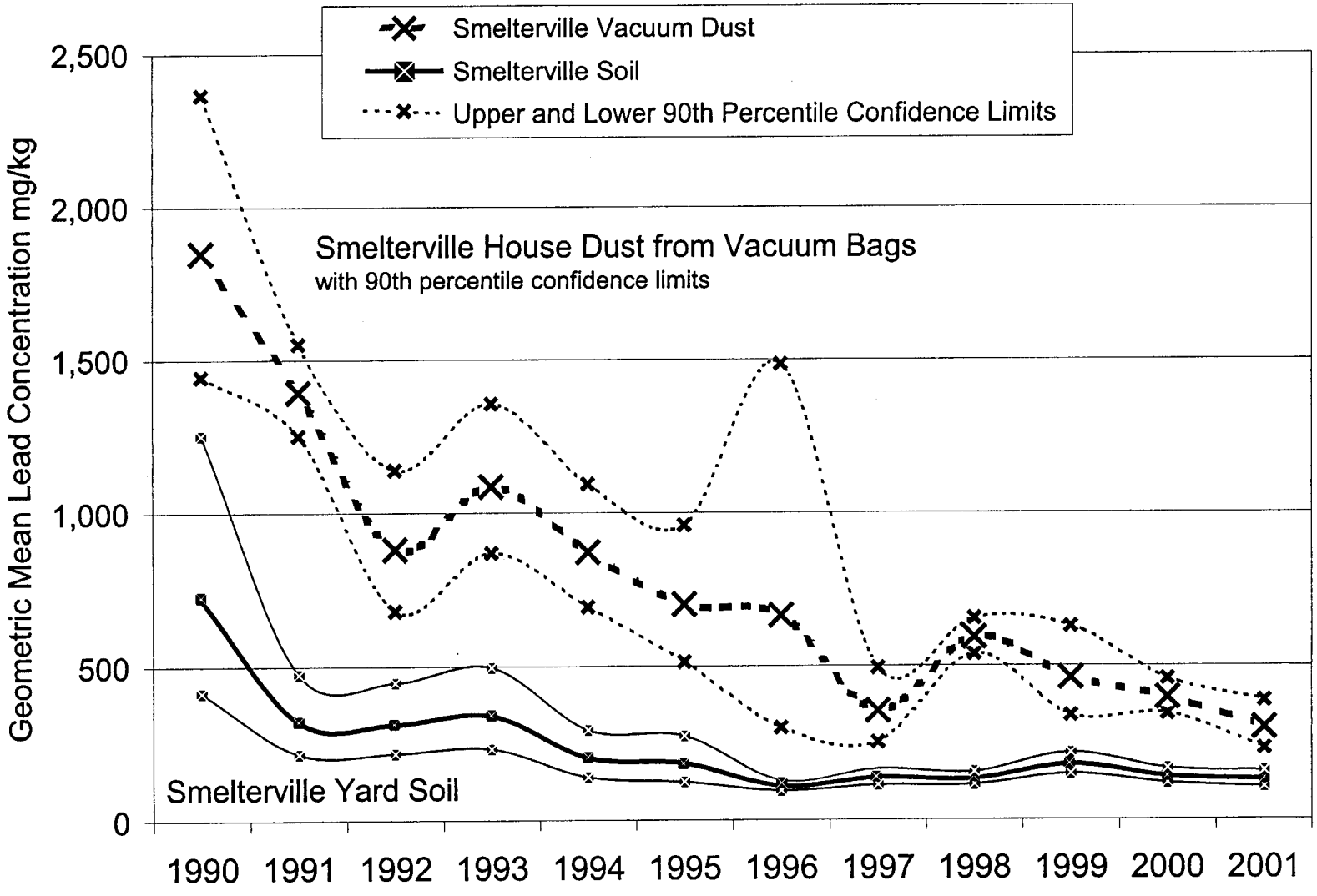
- Some people felt EPA should be in charge of implementing the cleanup because the contamination crosses a state line and affects tribal lands.

EPA has tried to work closely with people in the communities to understand and address these concerns. Some of the things people in the Basin continue to be most concerned about, such as the boundaries of the Superfund site and whether EPA is involved in the cleanup, are outside of the scope of EPA Region 10's decision-making authority. In the case of the boundaries of the Superfund site, EPA has applied the CERCLA definition of a Superfund site, not expanded the boundaries. Because of this, some people feel that EPA has not listened to them, and they are not satisfied that the cleanup plan addresses their concerns.

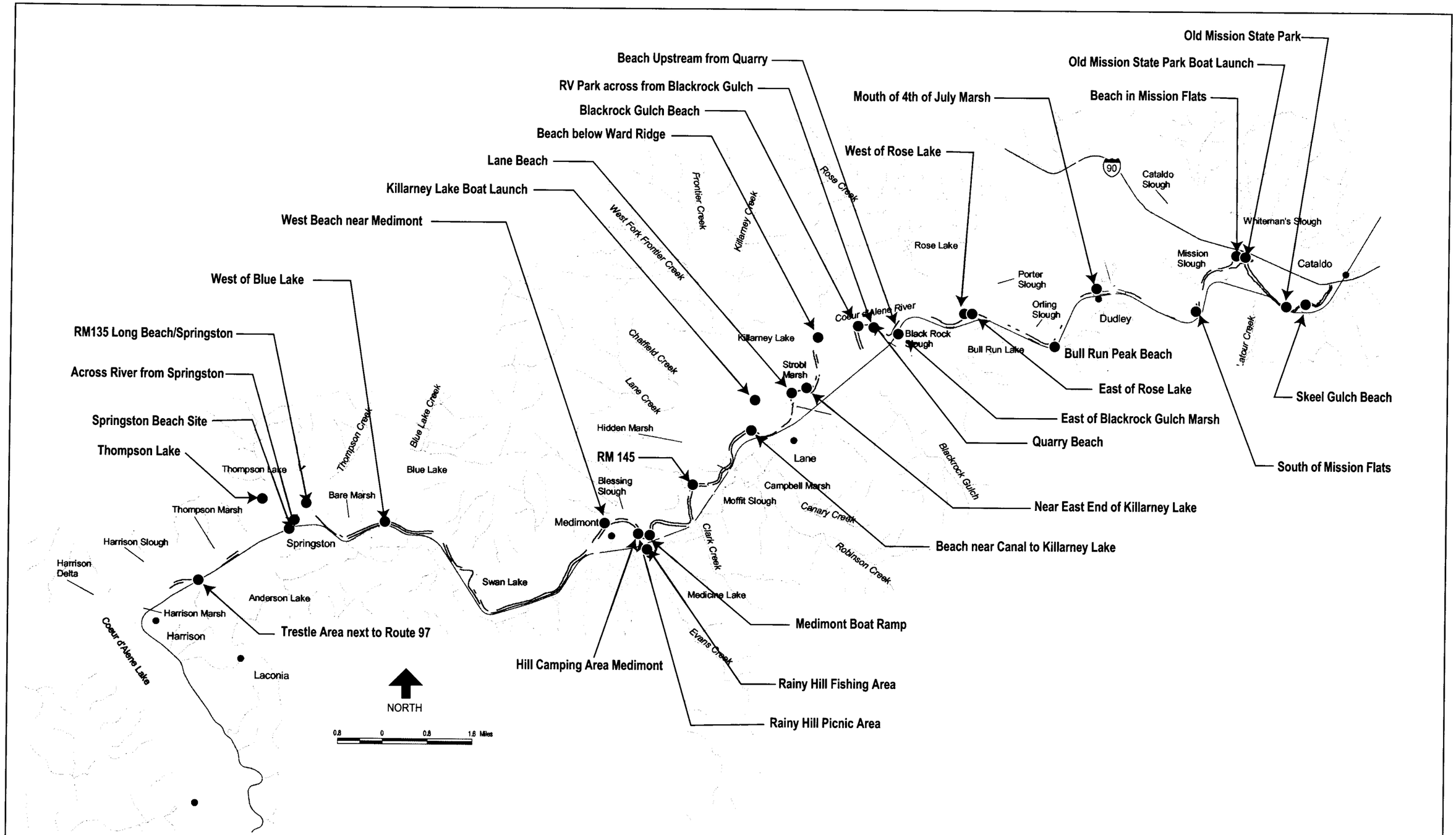
Despite the fact that on many issues there are widely divergent opinions, there has steadily been a growing recognition in the Basin communities that some cleanup work is needed. People agree that the work should be done as quickly as possible and with as little disruption as possible. People generally agree that the states, tribes, local governments and citizens should be directly involved in planning and implementing the cleanup activities that affect them.

EPA has made no assumptions about specific work beyond this Selected Remedy. The Selected Remedy allows for significant improvements for human health and the environment.

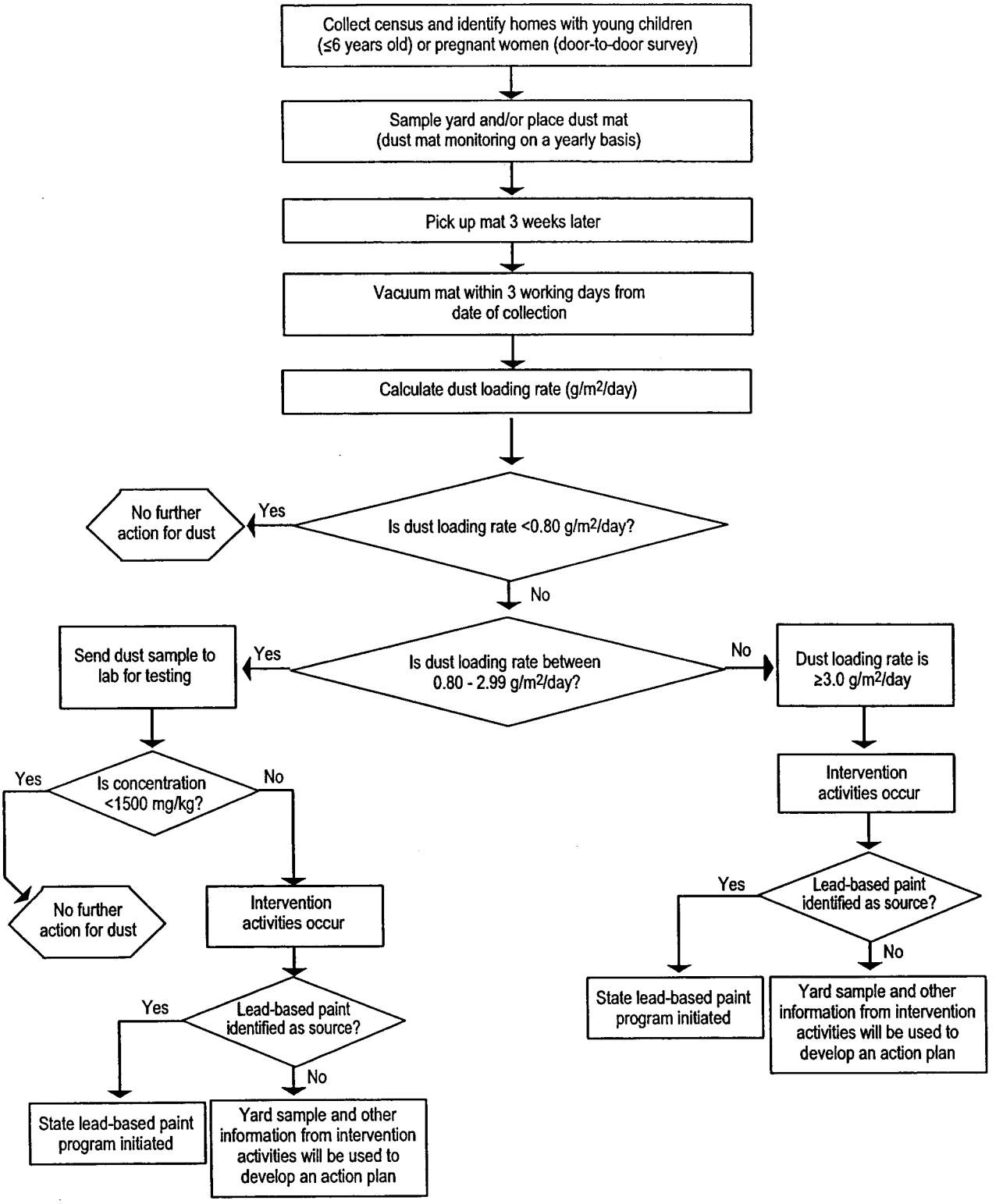
EPA looks forward to working together with all of the people in the Basin to make sure the cleanup plan is carried out in a way that is acceptable to the communities so that, ultimately, both the Basin environment and the local economies are improved for this and future generations.



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.1-1** **Smelterville Soil and Dust Lead Geometric Means (1990-2001)** From homes with children participating in the Lead Health Intervention Program

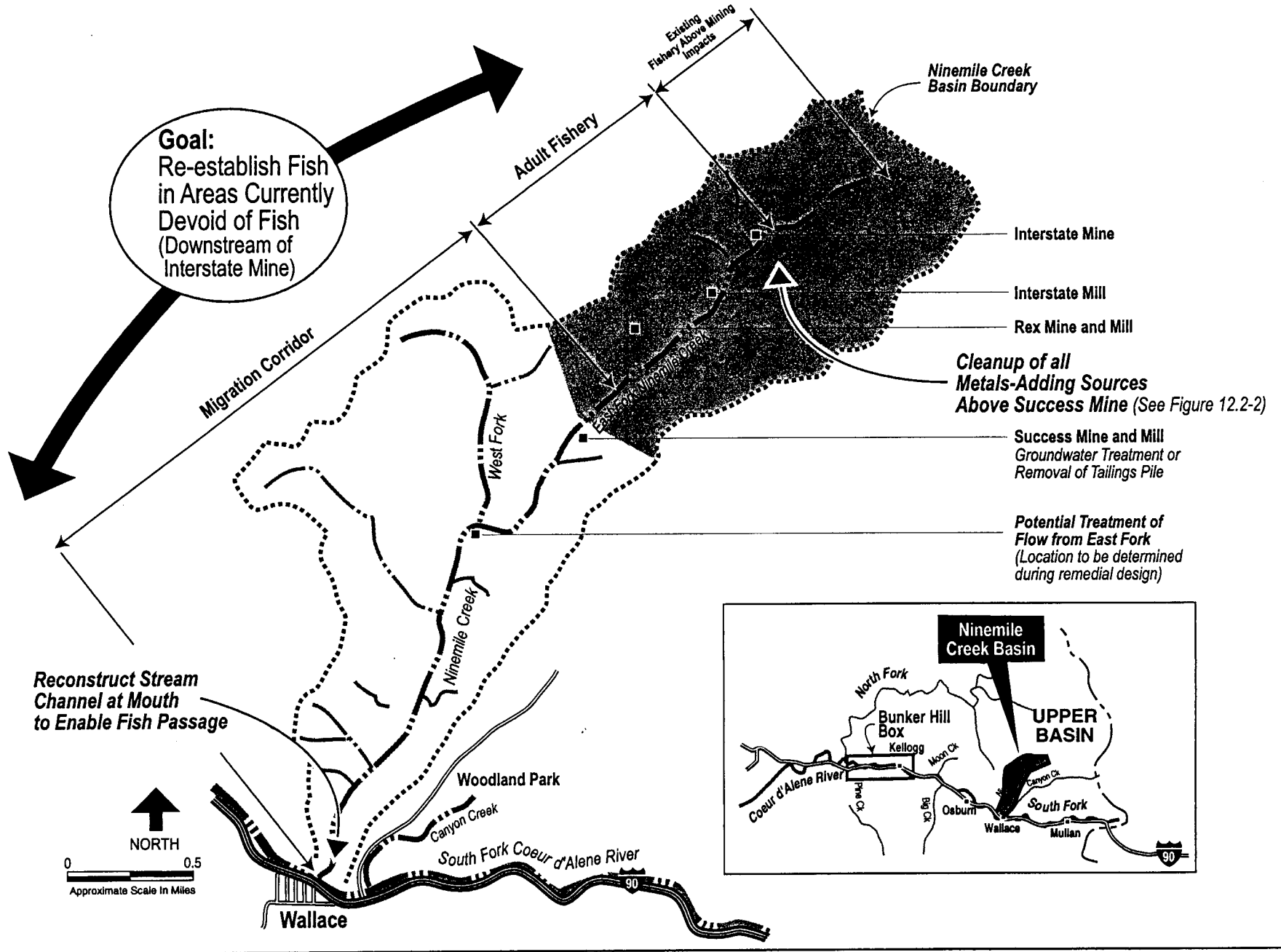


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.1-2** **Lower Basin Recreation Areas**



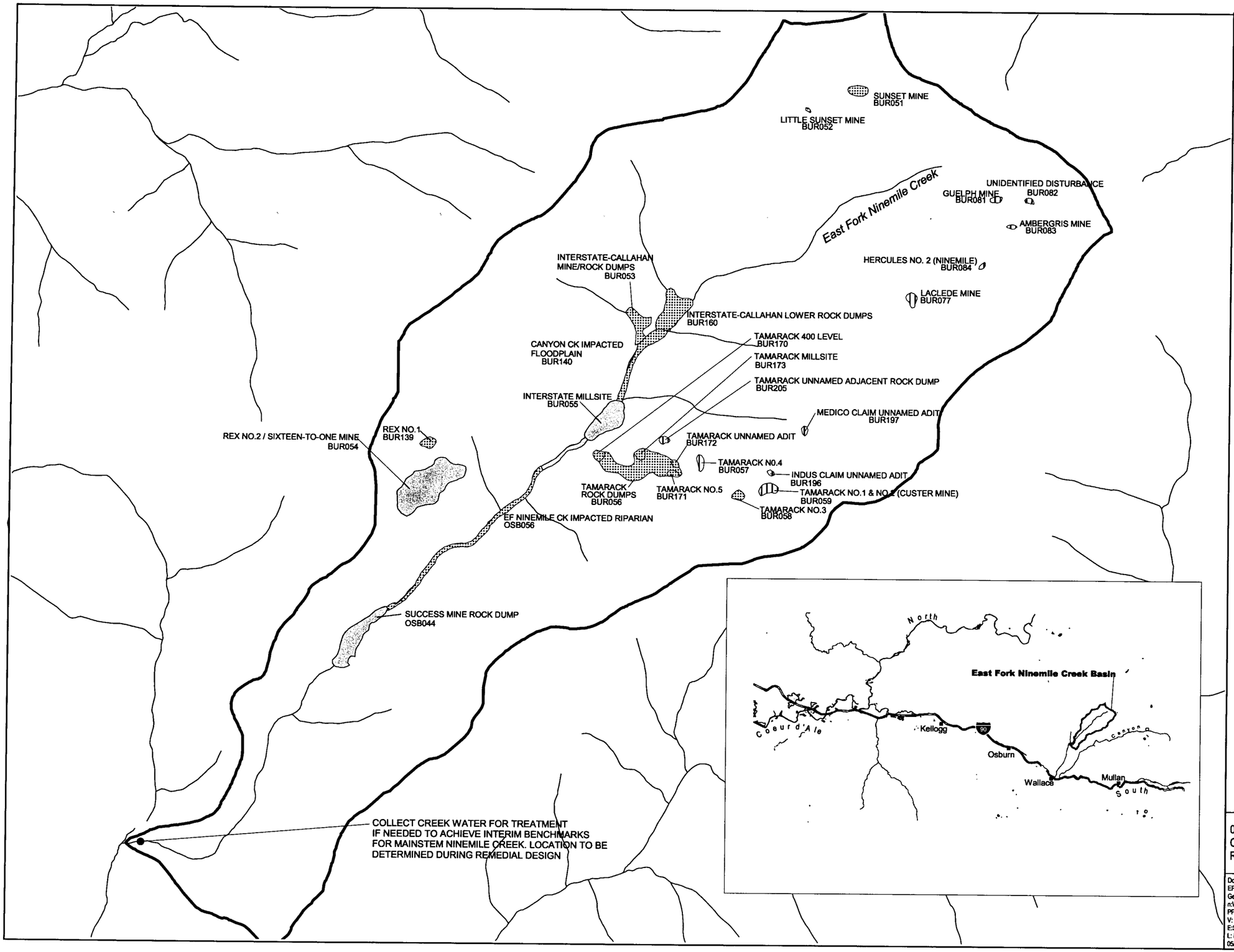
Reference: IDIQ (2001)

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.1-3** **Flow Diagram of Dust Intervention Protocol (based on dust mat monitoring)**



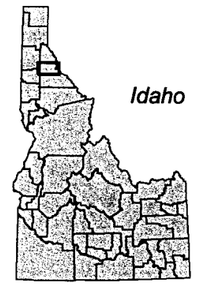
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.2-1** **Ninemile Creek Cleanup Actions and Fisheries Status After Implementation of the Selected Remedy**

Figure 12.2-2
East Fork Ninemile Creek
Cleanup Locations



LEGEND

- Stream
- City
- Ninemile Creek Watershed Boundary
- Source Area, Name, and Number
- No Action
- Remedial Action Selected in this ROD
- Removal Action by Others



Location Map

NOTE

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1:24,000

0 0.5 Miles

N

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Doc Control : 4162500.07099.05.a
EPA No. 2.9
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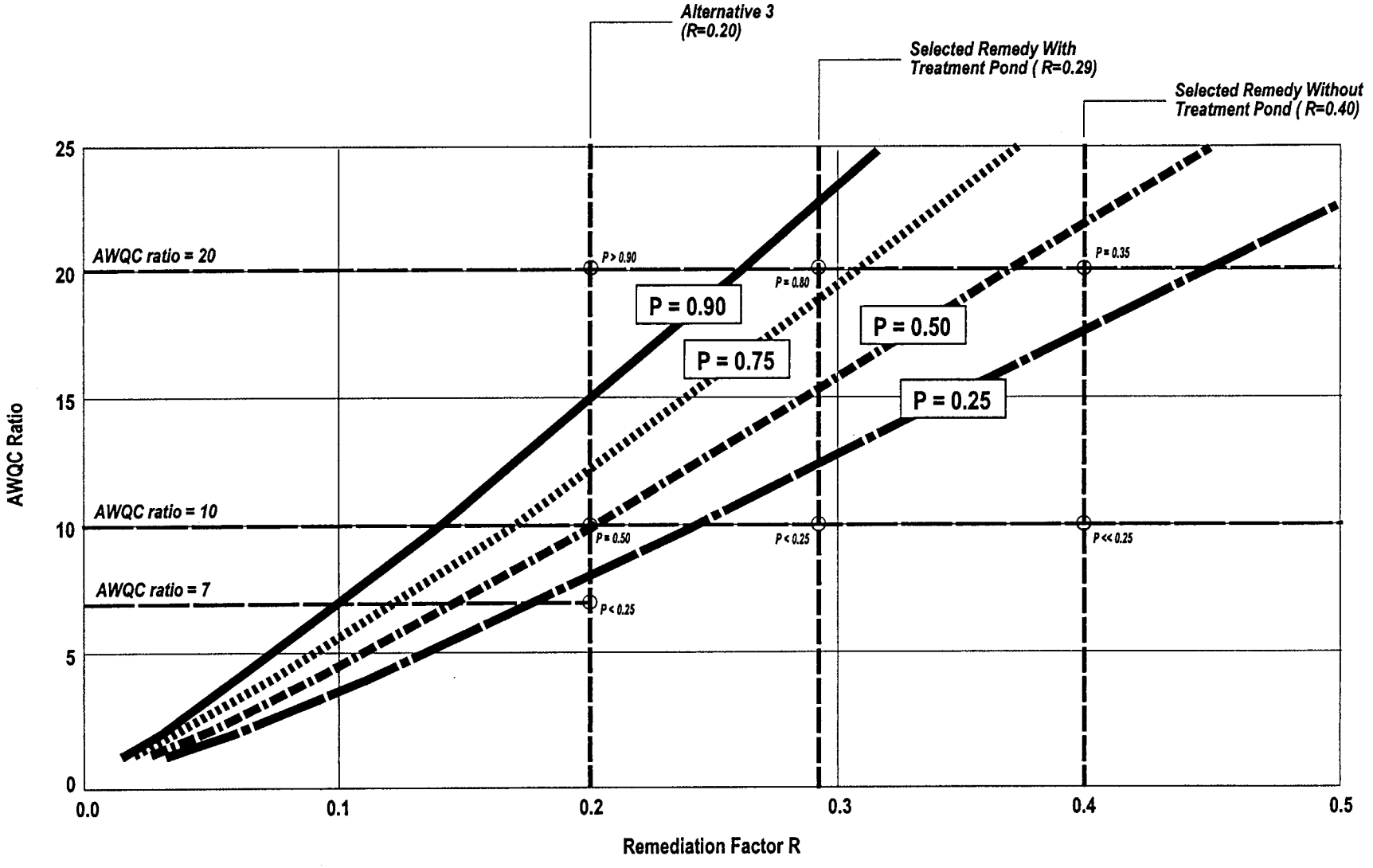
PP-NM Source Areas_01.apr
V: NM SEGS1-2 RA
E:SA
L: NM SEGS 1-2
05/01/02

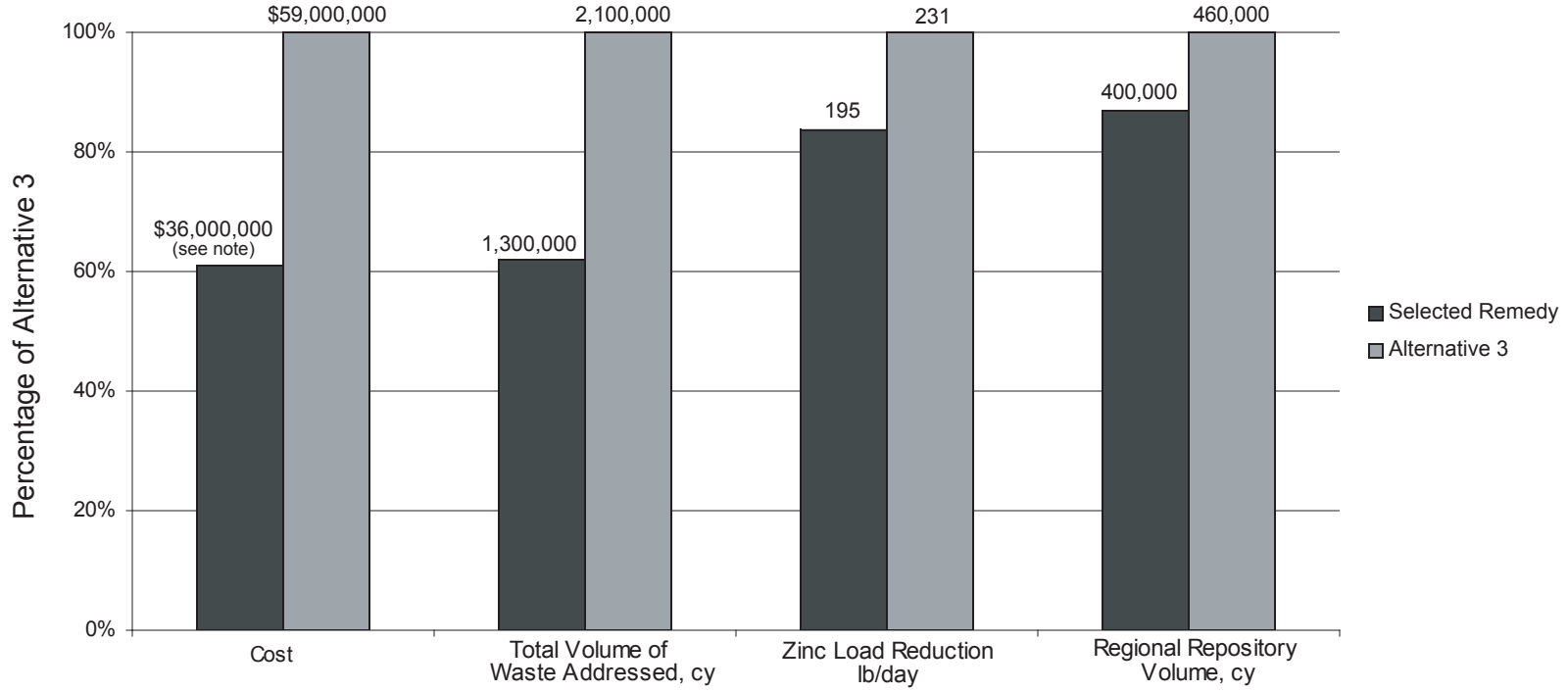
This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: August 14, 2002



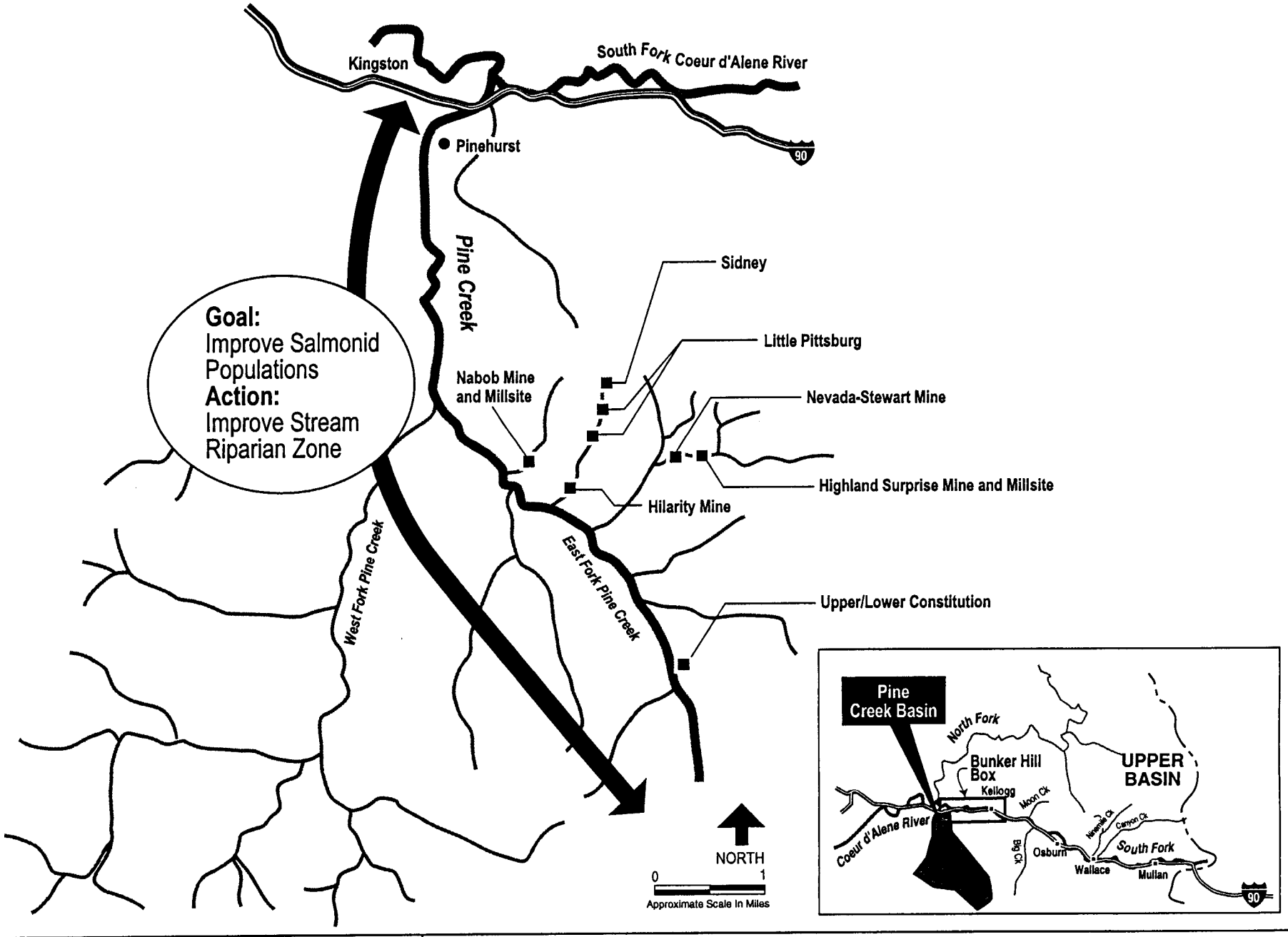
NOTES:
P = Estimated probability that AQWC ratio after implementation of remedy will be less than a given AWQC ratio
R = Estimated fraction of current load at NM305 that will remain after implementation of cleanup
AWQC ratio = Concentration divided by AWQC

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.2-3** **Probability of Achieving Various AWQC Ratios as a Function of the Remediation Factor R - Ninemile Station NM305**



Note:
Cost including all contingent remedies. Estimated cost without contingent remedies = $13,500,000.

Figure 12.2-4
Comparison of Selected Remedy to Alternative 3, Ninemile Creek



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RECORD OF DECISION

Doc. Control: 4162500.07099.05.a
EPA No. 2.9

Figure 12.2-5
Pine Creek Cleanup Actions and Fisheries Status After Implementation of Selected Remedy

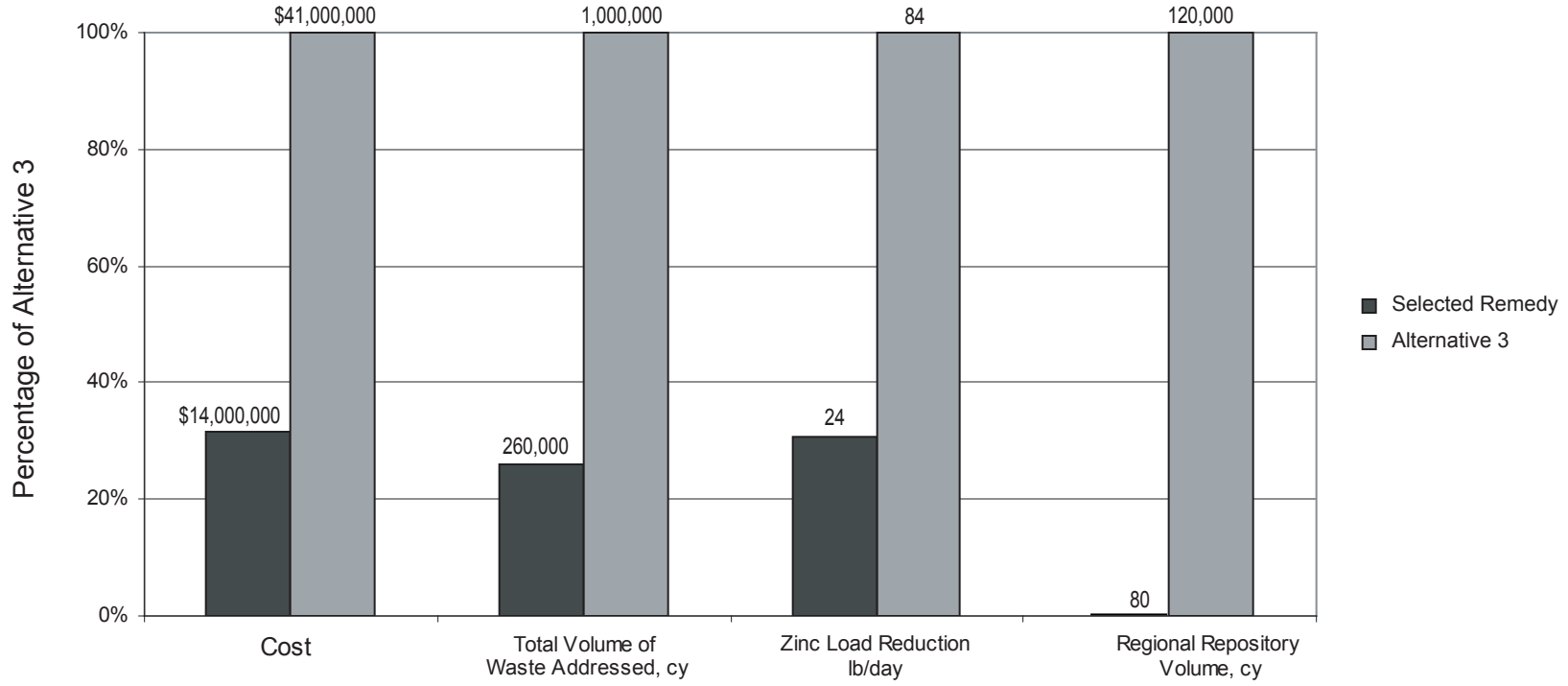
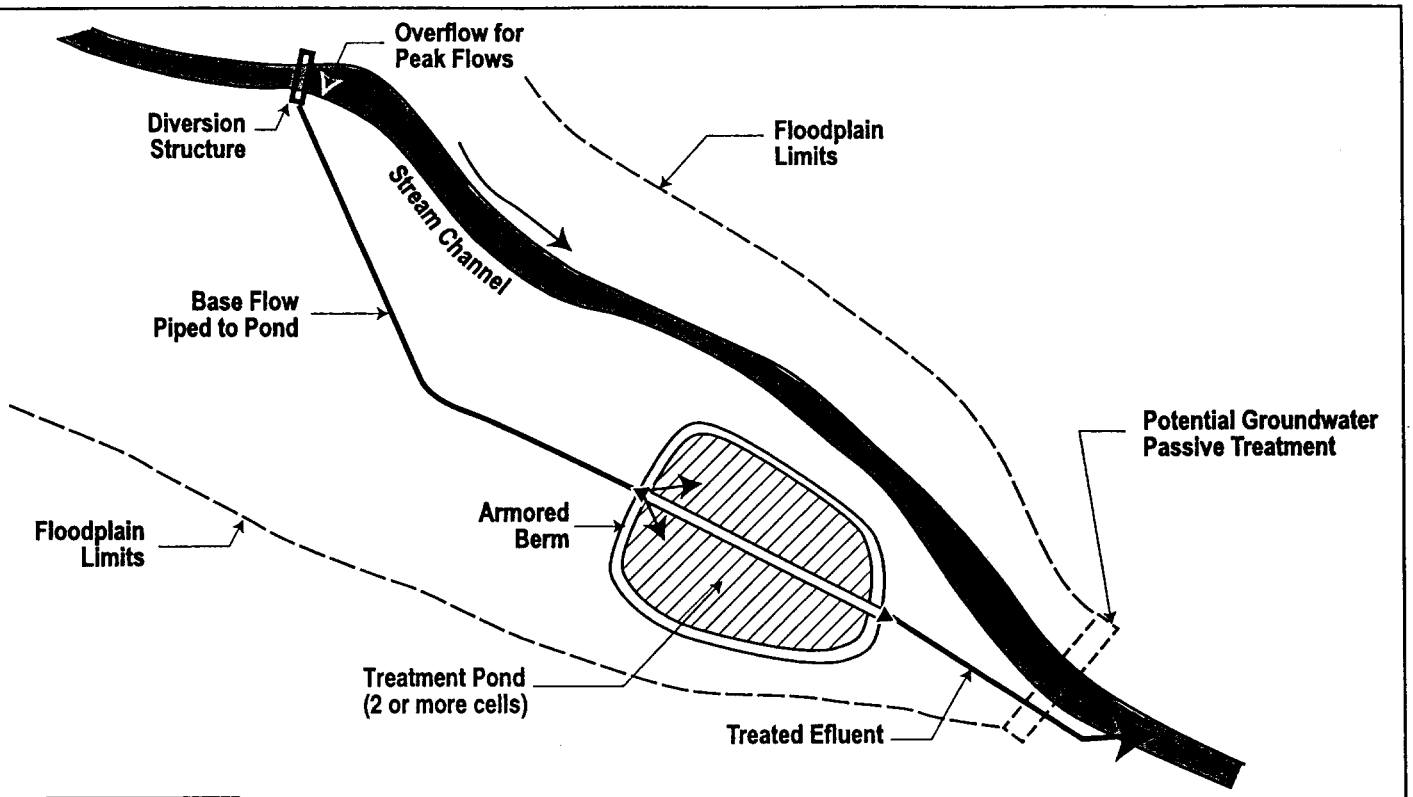
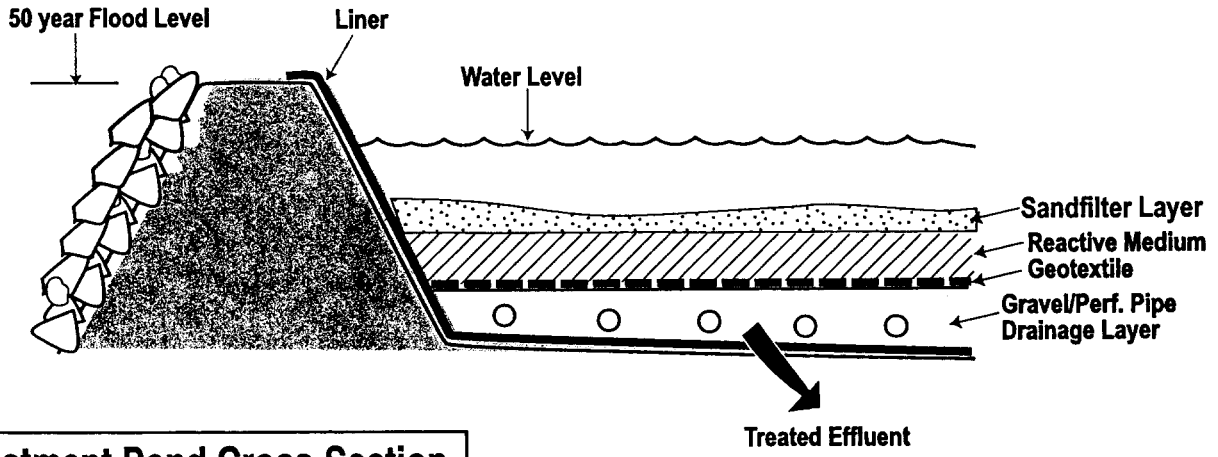


Figure 12.2-6
Comparison of Selected Remedy to Alternative 3, Pine Creek



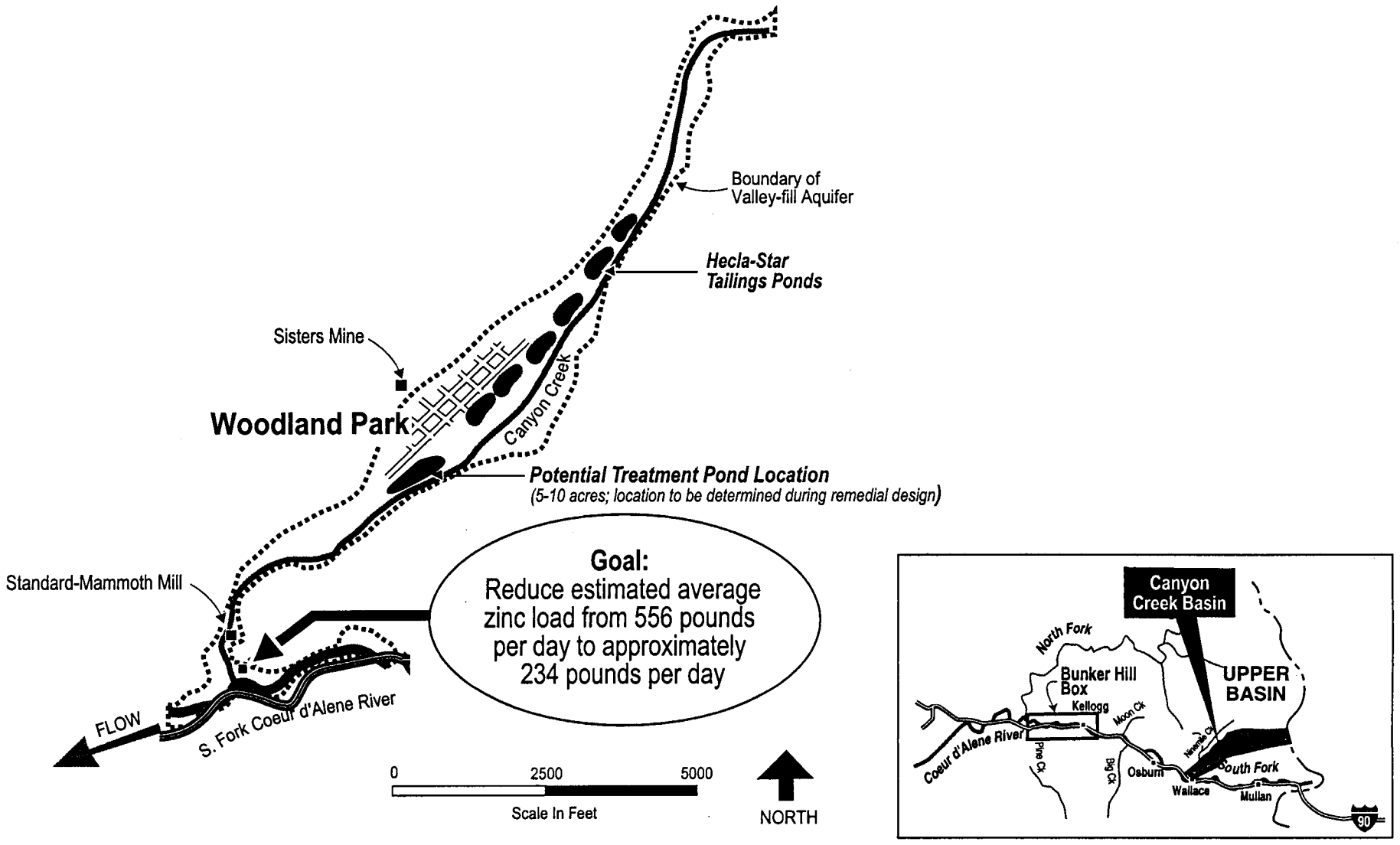
Plan View



Treatment Pond Cross-Section

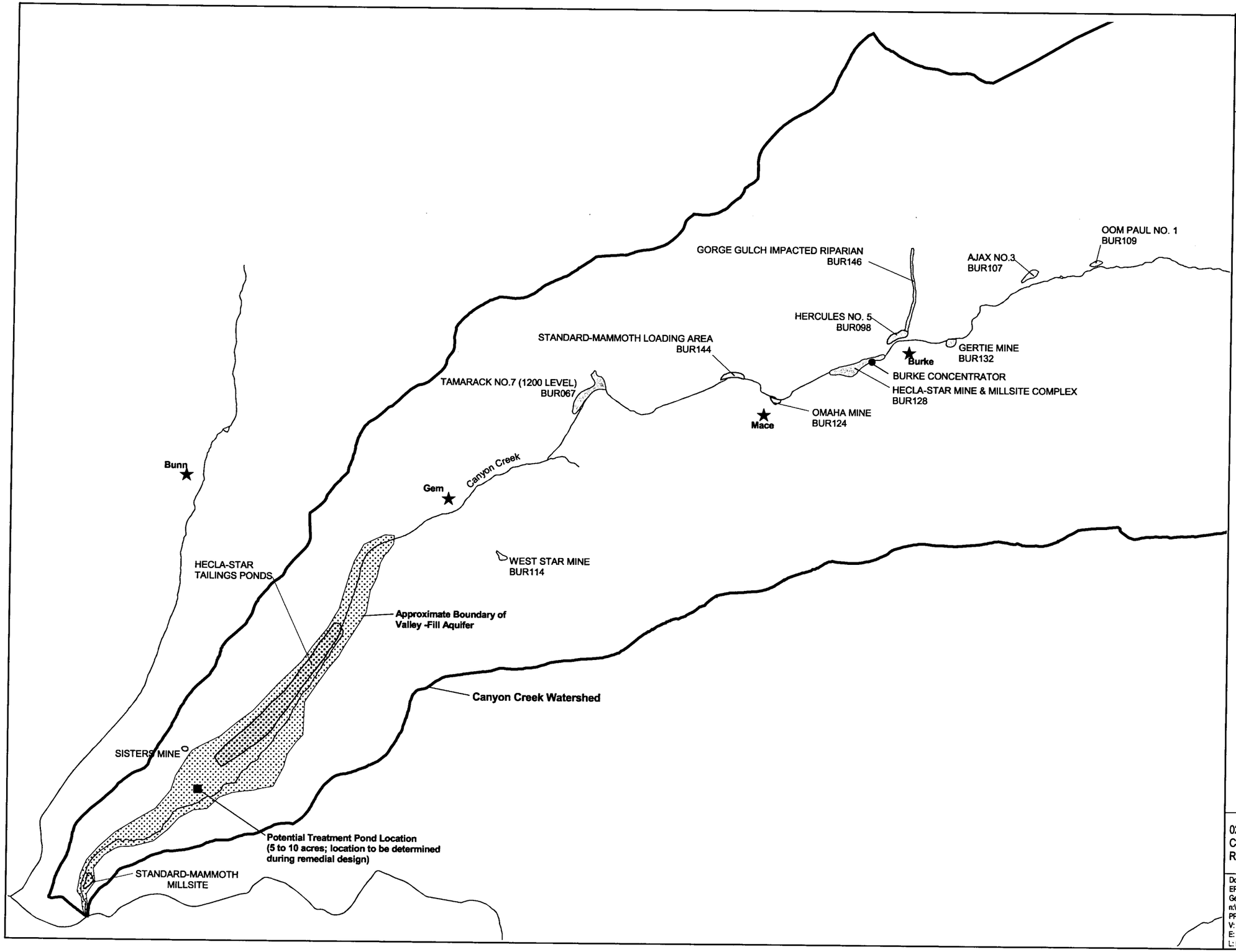
Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	Figure 12.2-7 Treatment Pond Conceptual Design



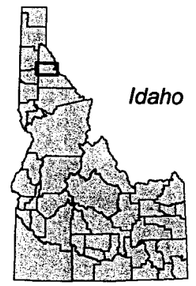
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12-2-8** **Lower Canyon Creek Cleanup Actions**

Figure 12.2-9
Canyon Creek Cleanup Locations



LEGEND

- Stream
- City
- Canyon Creek Watershed Boundary
- Approximate Location of Valley Fill Aquifer



Location Map

NOTE

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

N

SCALE 1:24,000

0 0.5 Miles

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Generation 1
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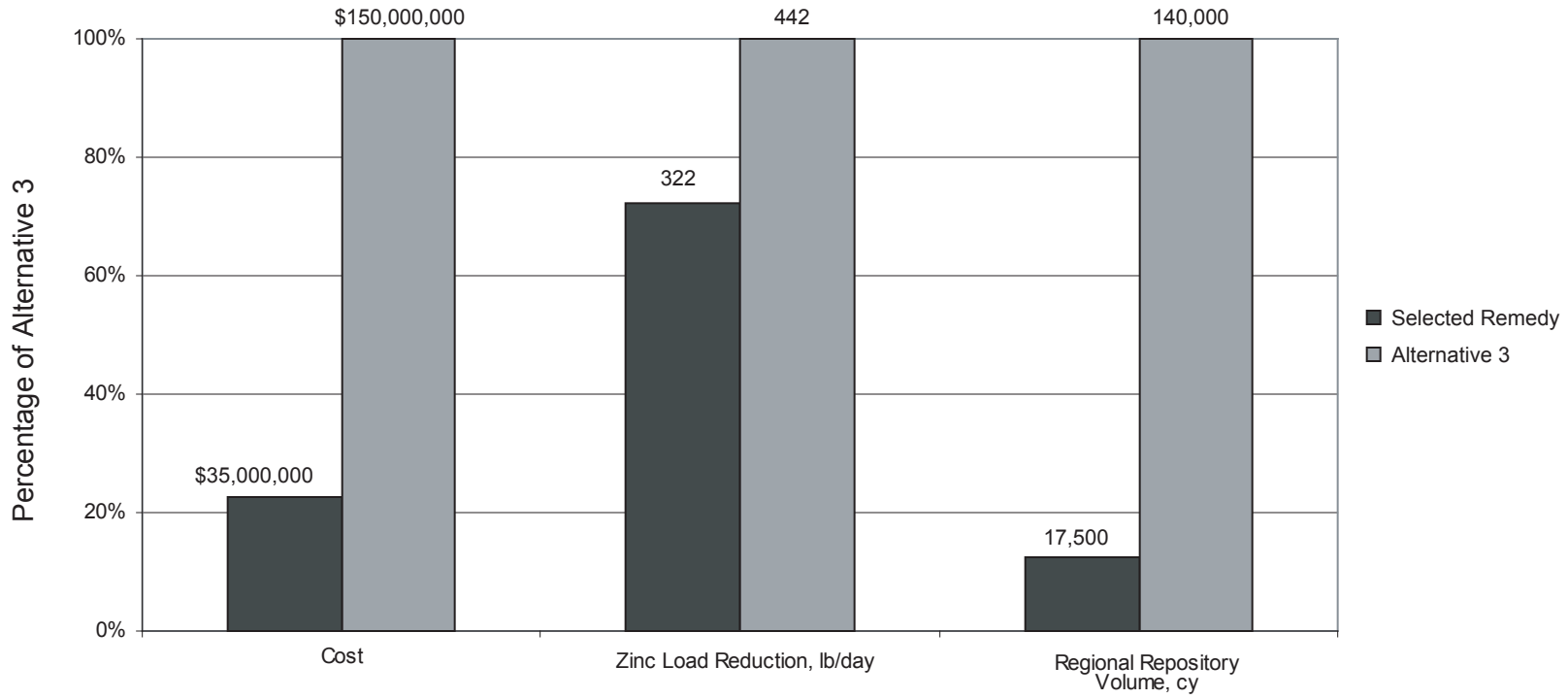
PP-NM Source Areas_01.apr
V: View 2
E:
L: Fig 12.2-4

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: May 01, 2002



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RECORD OF DECISION

Doc. Control: 4162500.07099.05.a
EPA No. 2.9

Figure 12.2-10
Comparison of Selected Remedy to Alternative 3, Canyon Creek

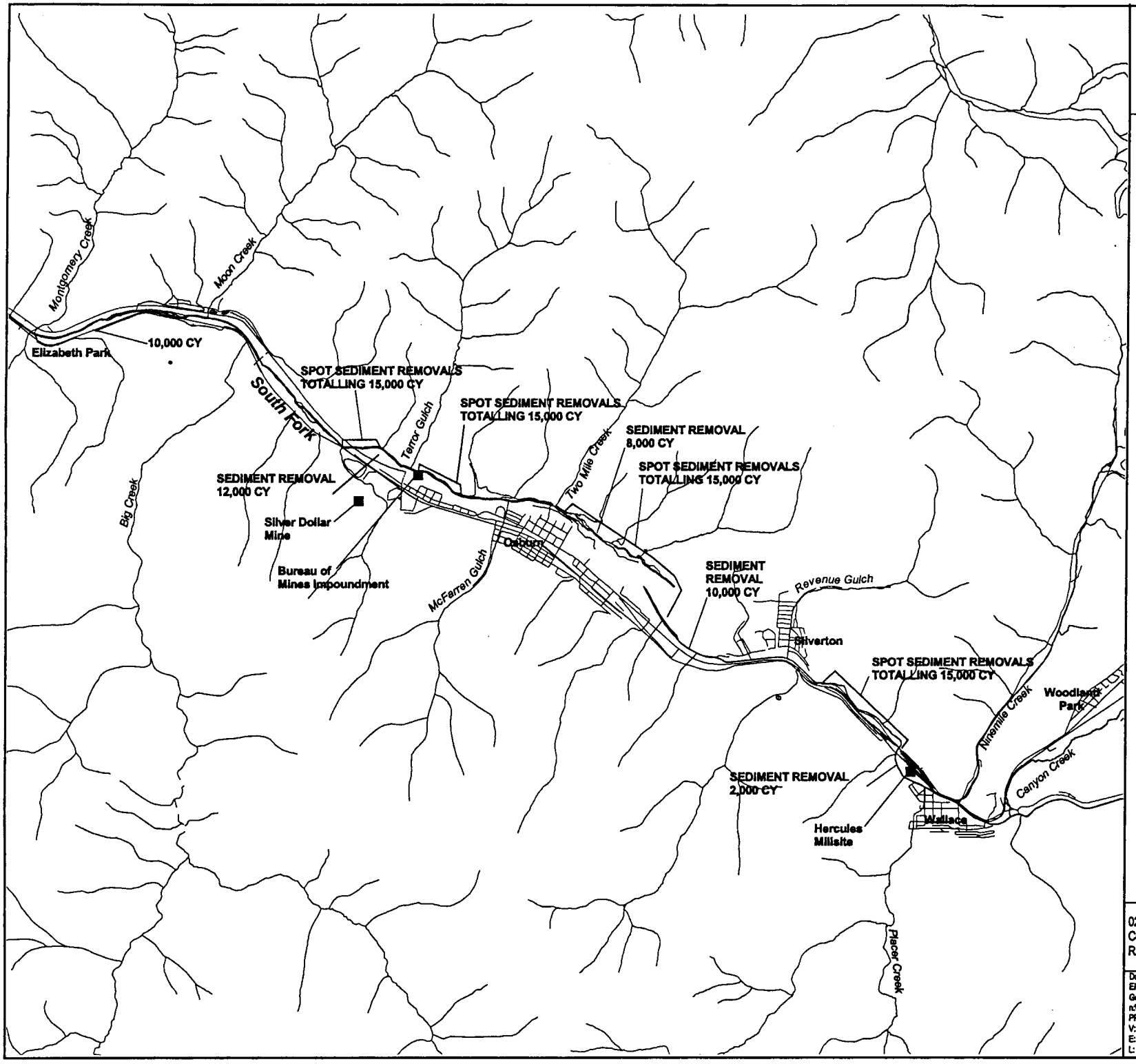
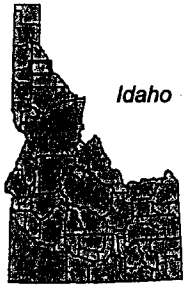


Figure 12.2-11
South Fork Cleanup Locations

LEGEND

Stream

Road



Location Map

NOTE

1) Base map coverages obtained from the Coeur d'Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

N

SCALE 1:70,000

0 1 Miles

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V: View 3
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L: Layout 1

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: May 2, 2002

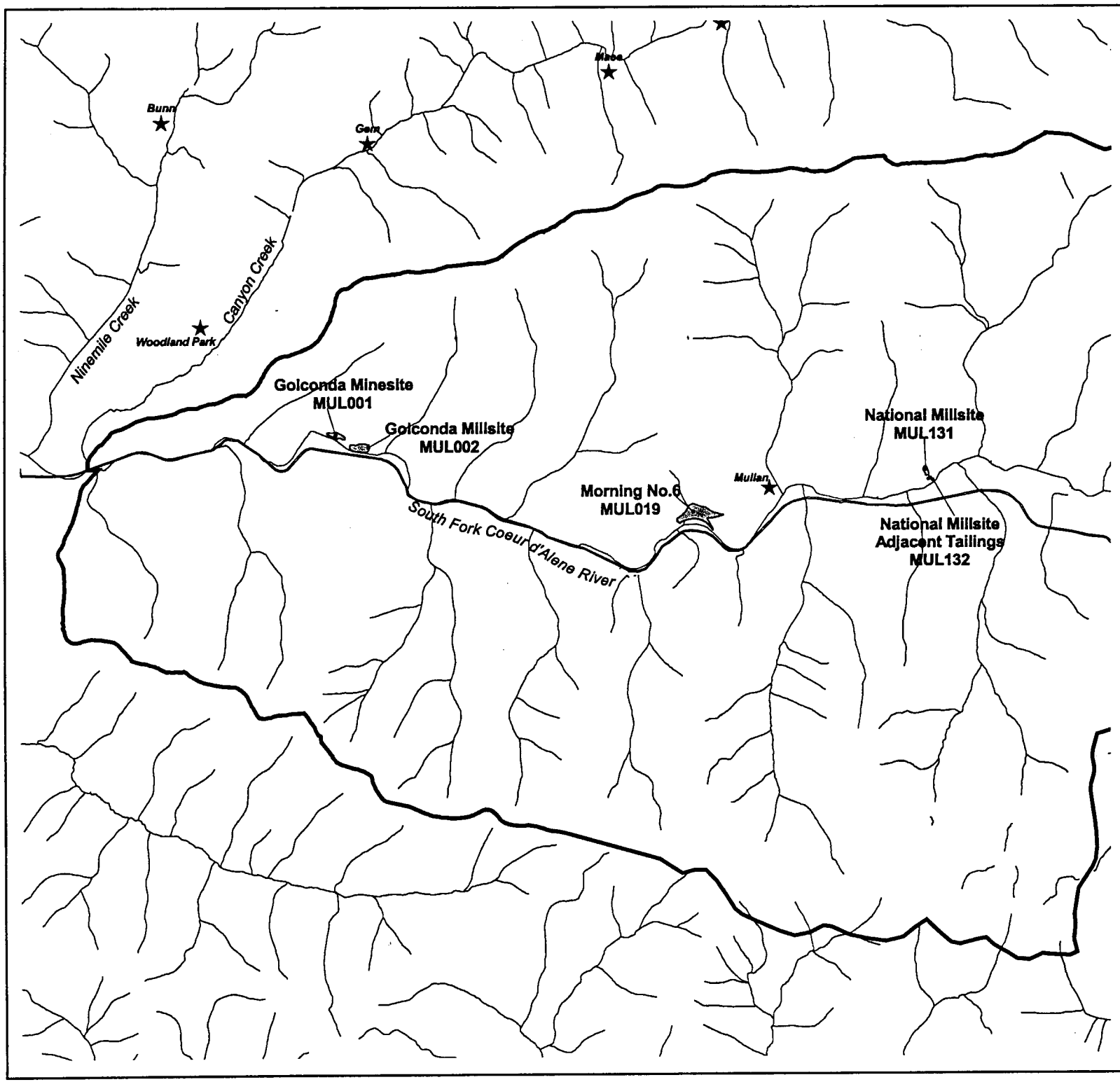
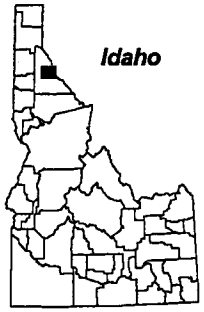


Figure 12.2-12
Upper South Fork
Cleanup Locations

LEGEND

- Stream
- I-90
- City
- Source Area, Name, and Number



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Indian Tribe, URS Greiner, CH2M Hill, and the BLM.

SCALE 1:66,000

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areas_usfcdar.apr
VIEW: USFCDAR Soil
EXTENT:West
LAYOUT: USFCDAR Soil West
05/02/2002

This Map is based on Idaho State Plane West Zone, North American Datum 1983

Date of Plot: August 14, 2002

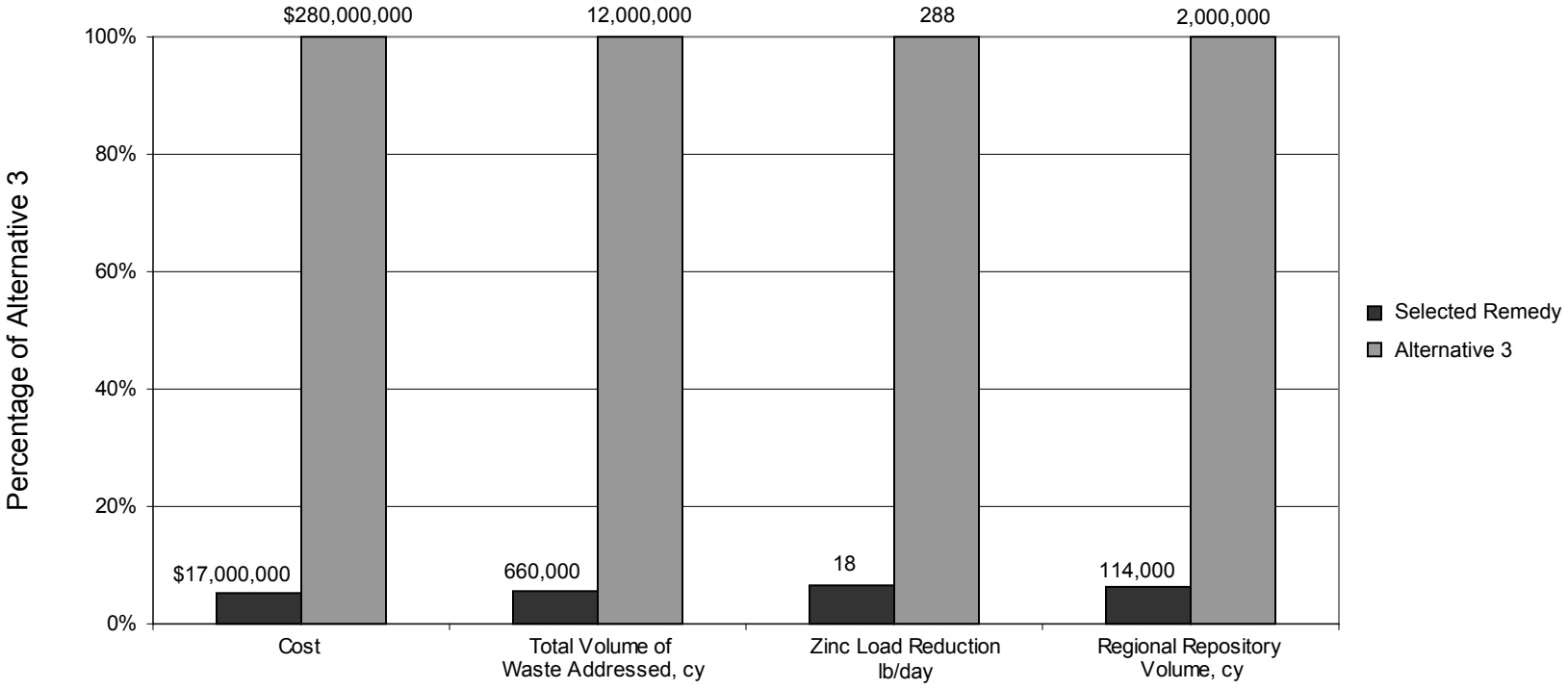
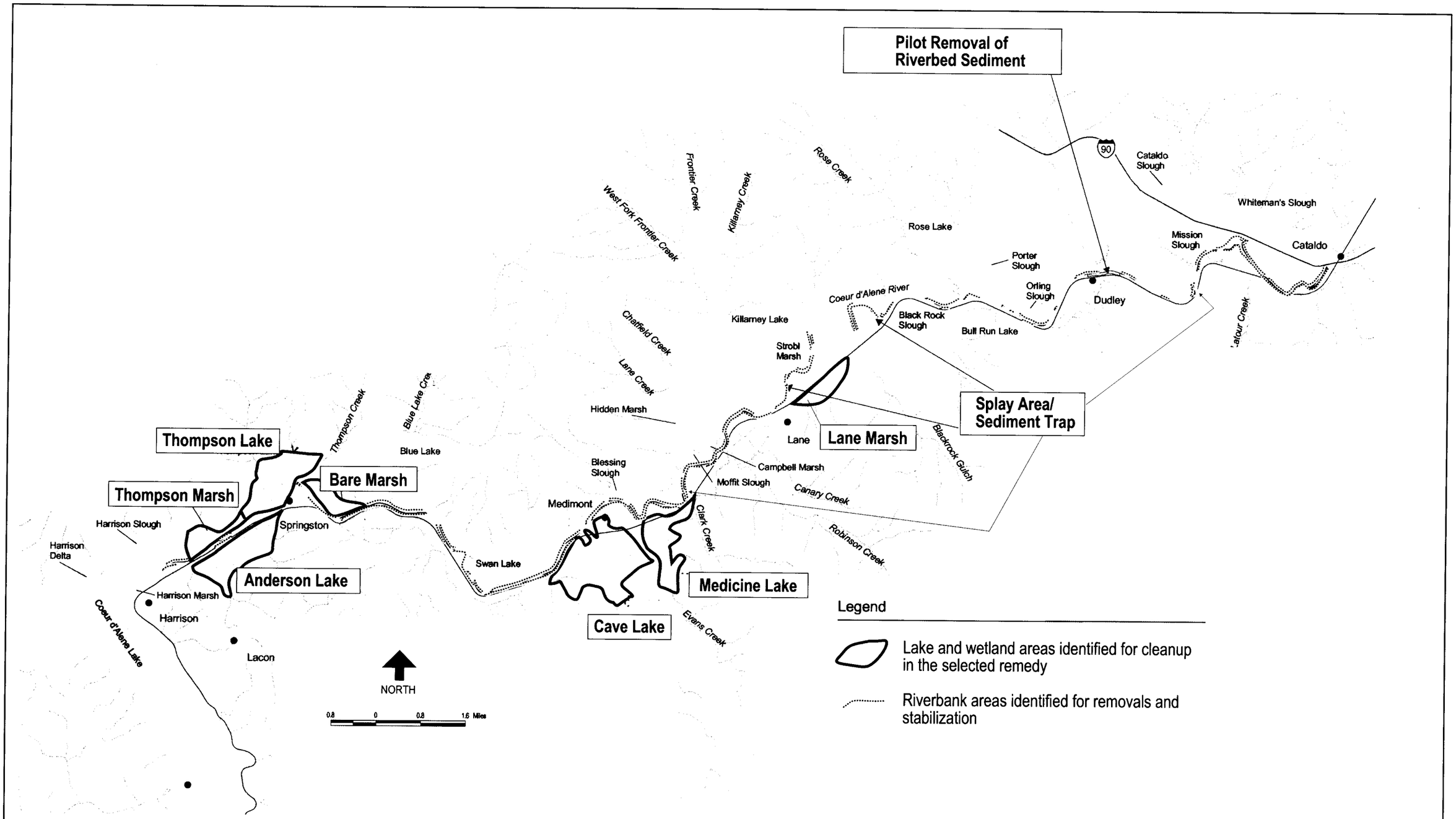
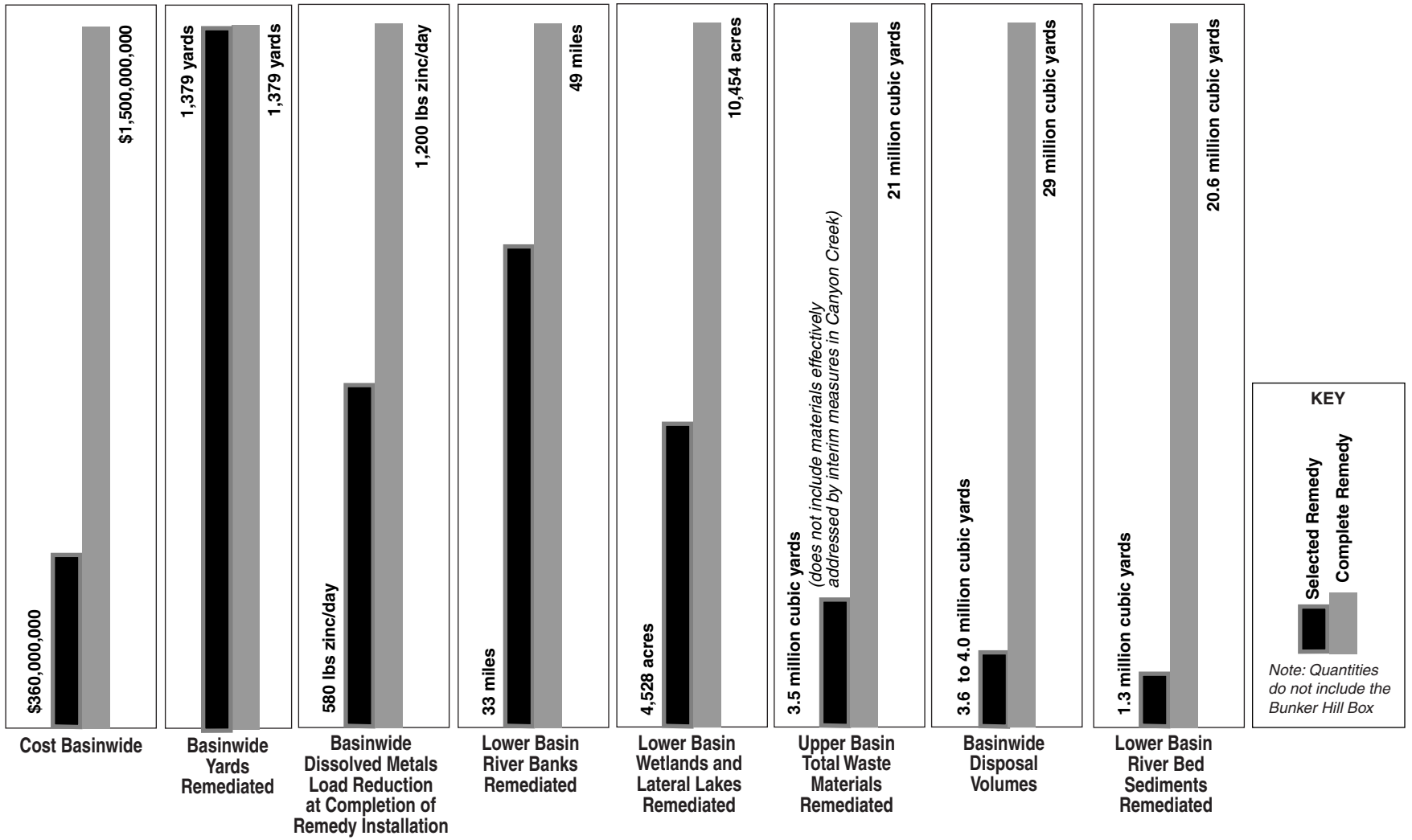


Figure 12.2-13
Comparison of Selected Remedy to Alternative 3, South Fork



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS RECORD OF DECISION	Doc. Control: 4162500.07099.05.a EPA No. 2.9	**Figure 12.2-14** **Lower Basin Cleanup Actions**



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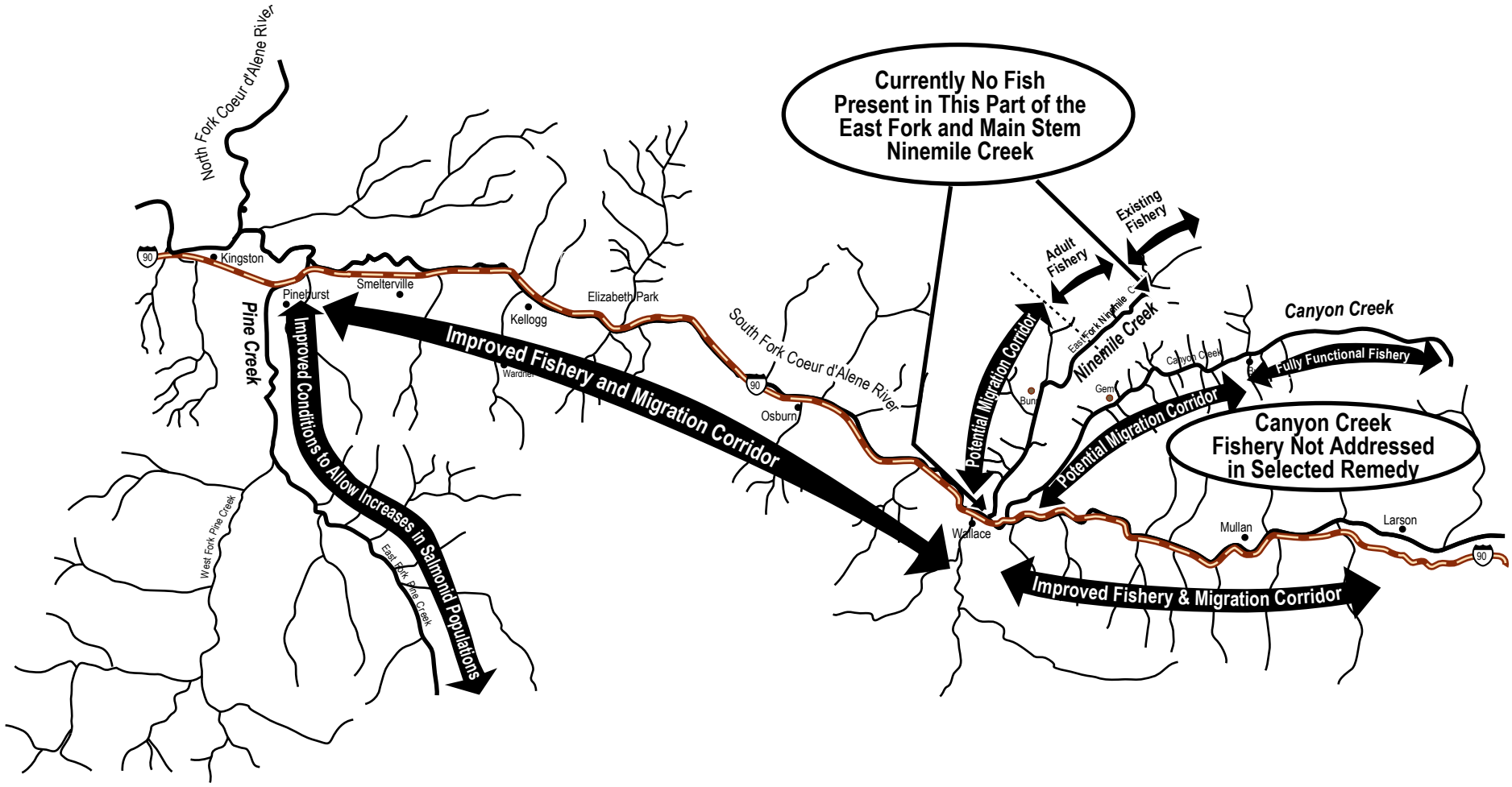
EPA No. 2.9

Figure 12.2-15
Comparison of Selected Remedy to Complete Remedy



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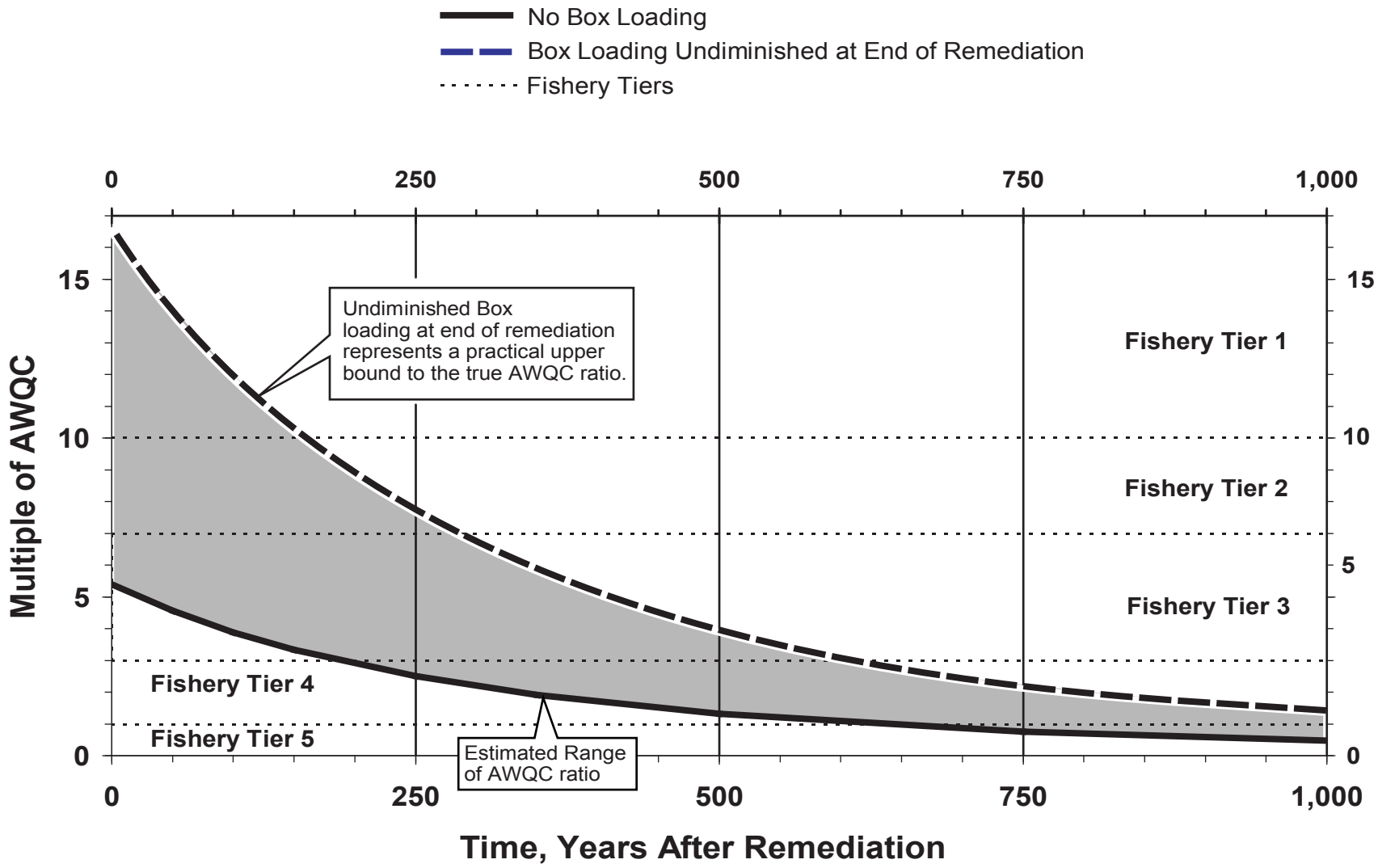
Coeur d'Alene Basin RI/FS
RECORD OF DECISION

Doc. Control: 4162500.07099.05.a
EPA No. 2.9

Figure 12.2-16
Upper Basin Fisheries Status after Implementation of Selected Remedy



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Coeur d'Alene Basin RI/FS
RECORD OF DECISION

Doc. Control: 4162500.07099.05.a
EPA No. 2.9

Figure 12.2-17
Expected Value of Zinc AWQC Ratio at Pinehurst: Selected Remedy

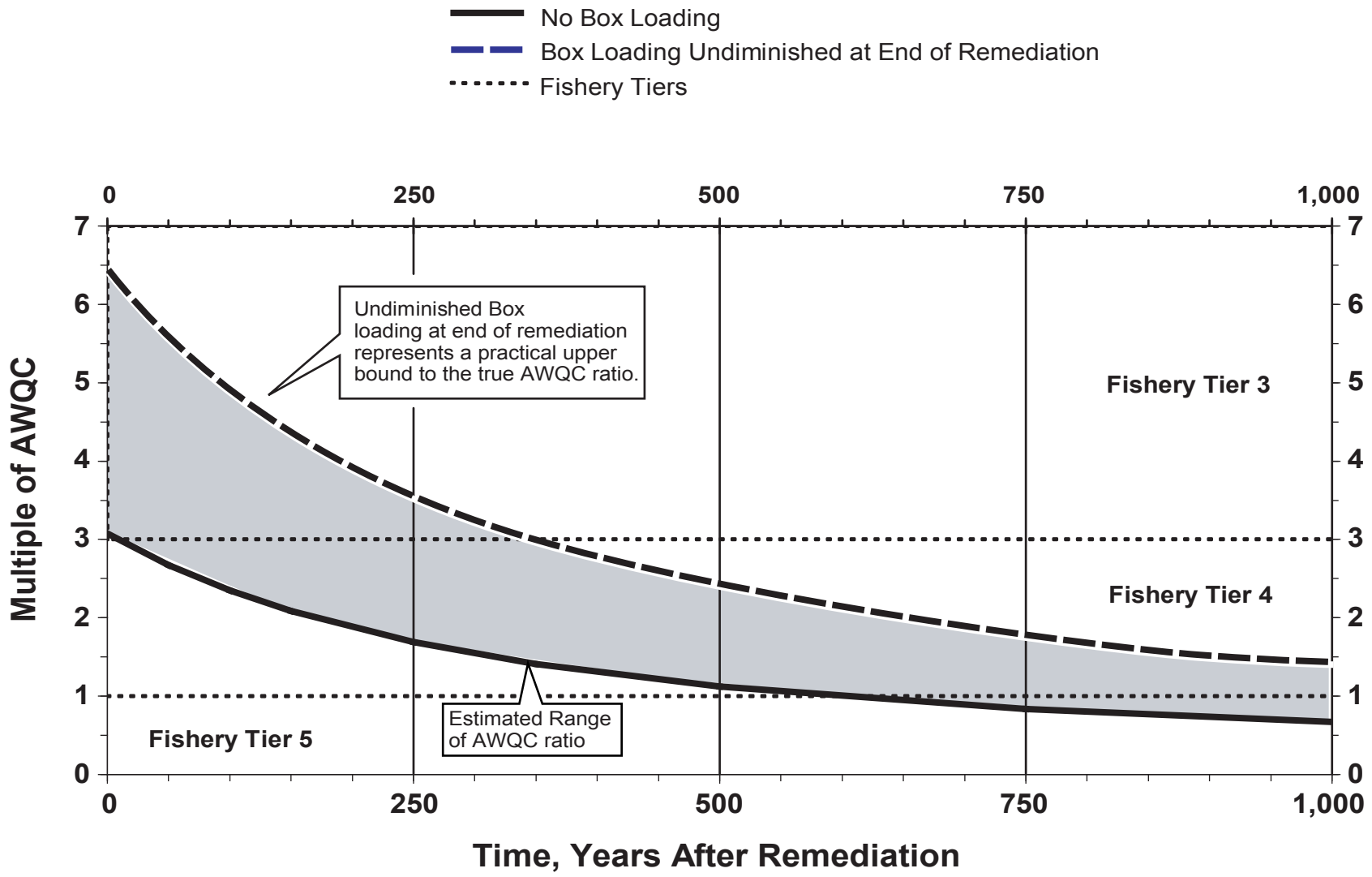
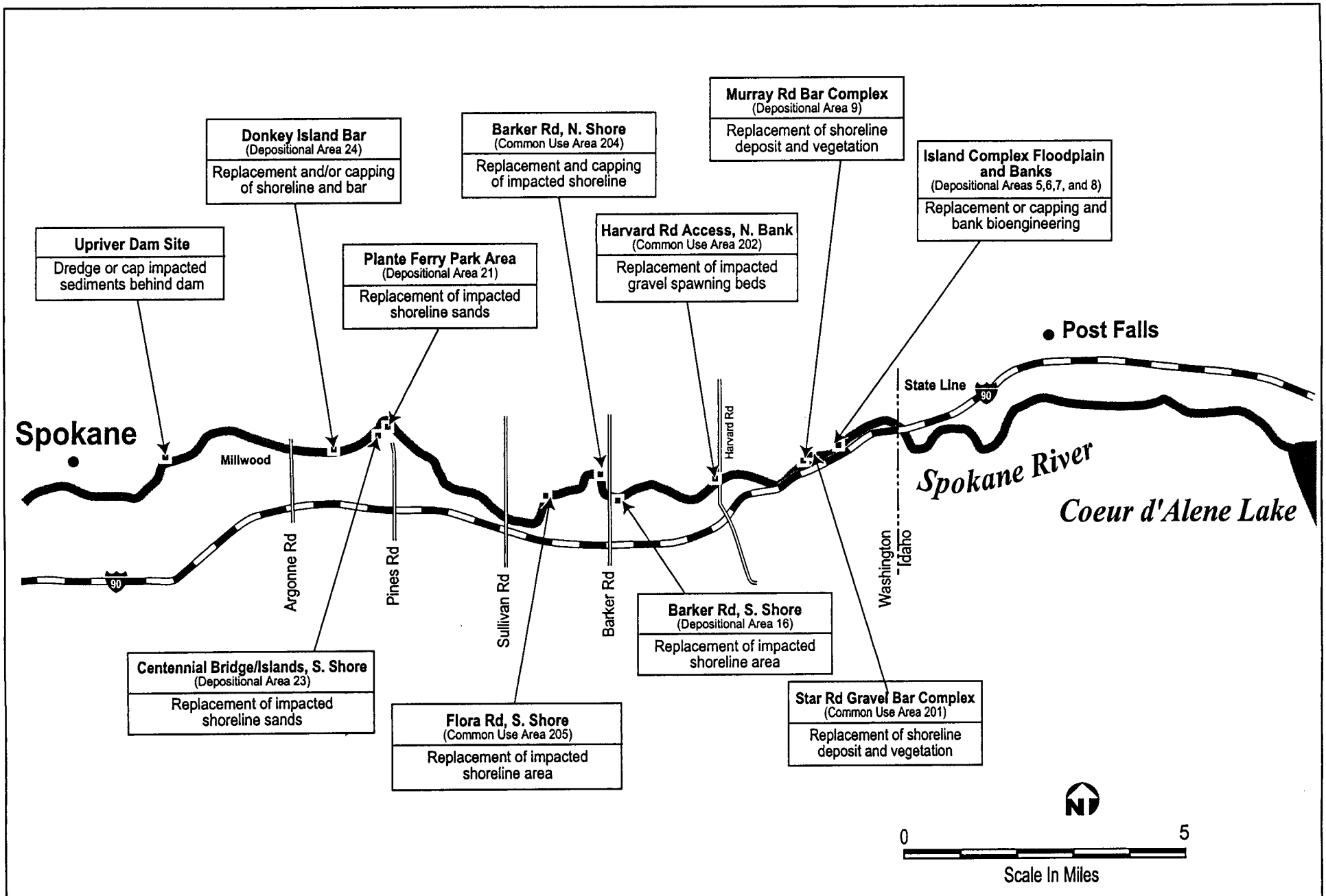


Figure 12.2-18
Expected Value of Zinc AWQC Ratio at Harrison: Selected Remedy



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Coeur d'Alene Basin RI/FS
RECORD OF DECISION

Doc. Control: 4162500.07099.05.a
EPA No. 2.9

Figure 12.4-1
Spokane River Cleanup Actions

Table 12.0-1
Summary of Feasibility Study Alternatives Used and Estimated Costs of the Selected Remedy

Area	Selected Remedy	Estimated Present Worth Capital Cost	Estimated Present Worth of O&M[a]	Estimated Total Cost
Human health protection in the community and residential areas of the Upper Basin and Lower Basin	Full remedy, including	**$91,000,000**	**$1,000,000**	**$92,000,000** including
	Soil and house dust, including yards, infrastructures, repositories, rights-of-way, commercial properties, and recreation areas. Alternatives S4 (Information and Intervention and Partial Removal and Barriers) and D3: (Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning)	$88,000,000 $2,100,000	$920,000 $100,000	$89,000,000[b] $2,200,000
	Drinking water: Alternative W6 (Public Information and Multiple Alternative Sources)	$910,000	$0	$910,000
	Aquatic food sources: Alternative F3 (Information and Intervention and Monitoring)			
Ecological protection in the Upper Basin and Lower Basin	Approximately 30 years of prioritized actions	**$210,000,000**	**$39,000,000**	**$250,000,000,** including
	Upper Basin tributaries	$74,000,000	$27,000,000	$100,000,000[c]
	Lower Basin river banks and bed	$66,000,000	$5,300,000	$71,000,000
	Lower Basin floodplains	$74,000,000	$7,200,000	$81,000,000
Coeur d'Alene Lake	Not included in the Selected Remedy			
Spokane River	Combination of elements of Spokane River Alternatives 3, 4, and 5	**$9,300,000**	**$1,300,000**	**$11,000,000[d]**
Monitoring	Basin-wide monitoring	**$0**	**$9,000,000**	**$9,000,000**
Total Cost[e]		**$310,000,000**	**$50,000,000**	**$360,000,000**

Table 12.0-1 (Continued)
Summary of Feasibility Study Alternatives Used and Estimated Costs of the Selected Remedy

Note: Costs are rounded to two significant figures.

[a] O&M = operations and maintenance. Estimated costs are the present worth costs of 30 years of O&M calculated using a discount rate of 7%.
[b] Includes costs for residential soil (Table 12.1-11), street rights of way, commercial properties, and common areas (Table 12.1-12), 31 recreational areas in the Lower Basin (Table 12.1-13), and house dust (Table 12.1-14).
[c] Includes costs for Ninemile Creek (Table 12.2-3), Pine Creek (Table 12.2-4), Canyon Creek (Table 12.2-5), and South Fork (Table 12.2-6). Includes actions at mine and mill sites with human health concerns, as well as ecological concerns. Ninemile Creek costs include contingent actions, which have an estimated total cost of $23,000,000 (including $18,000,000 capital cost and $4,500,000 O&M)
[d] Upper bound estimate for Spokane River. Lower bound total estimated cost = $4,500,000.
[e] Total costs are the sums of the bolded values, rounded to two significant figures.

Table 12.1-1
Estimated Number of Residential Yards Exceeding Lead Cleanup Levels in the Upper Basin and Lower Basin

Area	Estimated Total Residential Yards[a]	Estimated Percentage of Yards Exceeding Cleanup Level[b]		Estimated Number of Yards Exceeding Cleanup Level[c]	
		700 mg/kg	1,000 mg/kg	700 mg/kg	1,000 mg/kg
Upper Basin	3,776	34	21	1,272	800
Lower Basin	821	13	13	107	107
Total	4,597	30	20	1,379	907

[a] Total numbers of yards estimated on the basis of the total yards for investigation areas reported in Table 3-18 of the Human Health Risk Assessment (IDHW 2001a), except for Kingston and the Lower Basin. The total numbers of yards in Kingston and the Lower Basin were reduced by 50 percent to account for upland yards not exposed to potential contamination.

[b] The percentage of yards exceeding 1,000 mg/kg lead concentration was estimated on the basis of the percentage of yards exceeding 1,000 mg/kg lead in Tables 6-11a – 6-11j of the Human Health Risk Assessment; the percentage of yards exceeding 700 mg/kg lead concentration was estimated on the basis of the average of the percentage of homes remediated as listed in Tables 6-61d and 6-61e of the Human Health Risk Assessment.

[c] Estimated by multiplying the estimated total number of yards by the estimated percentage of yards exceeding the corresponding lead concentration.

Table 12.1-2
Summary of the Selected Remedy for Human Health Protection in Community and Residential Areas

Area	Remedial Action Objective	Actions
Soil and House Dust	Reduce mechanical transportation of soil and sediments containing unacceptable levels of contaminants into residential areas and structures. Reduce human exposure to soils, including residential garden soils, and sediments that have concentrations of contaminants of concern greater than selected risk-based levels for soil. (As described in Sections 7 and 12 of this ROD.) Reduce human exposure to lead in house dust via tracking from areas outside the home and air pathways, exceeding health risk goals.	**Alternative S4**: Reduce soil concentrations using information and intervention, community greening, partial removal, and barriers. Includes partial removal and replacement of residential soils with lead concentrations above 1,000 mg/kg (an estimated 907 residences), vegetative barriers to control or limit migration of soils between 700 and 1000 mg/kg (an estimated 472 residences), and a combination of removals, barriers, and access restrictions at commercial and undeveloped properties and recreation areas.
		Alternative D3: Reduce individual house dust lead concentrations and loadings using information and intervention, vacuum loan program/dust mats, interior source removals and controls, if necessary. An estimated maximum of 252 residences would require this additional cleaning. This would be coordinated with paint abatement programs (see Figure 12.1-3).
		Institutional Controls Manage contaminated material by protecting barriers put in place through establishment of an institutional controls program, which would include locally developed and enforced rules and regulations, disposal areas, clean fill sources, control of contaminated source areas and other considerations.
Drinking Water	Reduce ingestion by humans of groundwater or surface water withdrawn or diverted from a private, unregulated source, used as drinking water, and containing contaminants of concern exceeding drinking water standards and risk-based levels for drinking water.	**Alternative W6**: Public information and multiple alternative sources.
Aquatic Food Sources	Reduce human exposure to unacceptable levels of contaminants of concern via ingestion of aquatic food sources (e.g., fish and water potatoes).	**Alternative F3**: Information and intervention and monitoring
Estimated Total Present Worth Cost = $92,000,000		

Table 12.1-3
1996 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	8	6.6	5.2	25.0	12.5
2	10	5.7	4.6	10.0	10.0
3	8	4.8	3.7	12.5	0.0
4	10	3.4	3.0	0.0	0.0
5	11	6.5	5.5	27.3	9.1
6	11	4.3	3.5	9.1	0.0
All	58	5.2	4.2	13.8	5.2

Table 12.1-4
1997 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	2	—	—	—	—
2	1	—	—	—	—
3	4	6.8	6.2	25.0	0.0
4	3	—	—	—	—
5	2	—	—	—	—
6	1	—	—	—	—
All	13	6.0	4.9	15.4	7.7

Table 12.1-5
1998 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	9	8.7	8.0	33.3	11.1
2	9	6.6	5.5	11.1	11.1
3	10	7.1	5.7	20.0	10.0
4	18	5.5	4.8	11.1	0.0
5	13	5.0	4.6	0.0	0.0
6	11	6.3	5.4	7.1	7.1
All	70	6.3	5.4	12.92	5.7

Table 12.1-6
1999 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	21	6.6	6.0	14.3	0.0
2	26	9.0	7.1	34.6	19.2
3	30	6.8	5.5	20.0	10.0
4	26	6.5	4.8	19.2	11.5
5	36	5.3	4.5	5.6	2.8
6	23	4.5	3.9	4.3	0.0
All	162	6.4	5.2	16.0	7.4

Table 12.1-7
2000 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	18	6.3	4.5	16.7	11.1
2	13	6.4	5.5	15.4	0
3	18	6.1	5.4	11.1	5.6
4	14	6.6	5.4	21.4	7.1
5	14	5.8	5.1	21.4	0
6	25	4.4	3.8	4.0	0
All	102	5.8	4.8	13.7	3.9

Table 12.1-8
2001 Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	Number of Children Tested	Average Blood Lead µg/dL	Geometric Mean Blood Lead µg/dL	Percent of Children ≥ 10 µg/dL	Percent of Children ≥ 15 µg/dL
1	28	3.8	3.2	3.6	0
2	17	4.4	3.7	5.9	0
3	18	5.7	4.7	11.1	5.6
4	19	5.6	4.6	15.8	5.3
5	16	3.5	3.1	0	0
6	19	4.2	3.7	0	0
All	117	4.5	3.7	6.0	1.7

Table 12.1-9
Blood Lead Screening Results for the Basin by Year (Ages 0-6 Only)

Year	Number of Children Tested	Average Blood Lead µg/dL	Percent of Children ≥10 µg/dL	Percent of Children ≥ 15 µg/dL
1996	58	5.2	14	5
1997	13	6.0	15	8
1998	70	6.3	13	6
1999	162	6.4	16	7
2000	102	5.8	14	4
2001	117	4.5	6	2

Table 12.1-10
Estimated Number of Residences With Drinking Water MCL Exceedances in the Upper Basin and Lower Basin

Area	No. of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances	Availability of Suitable Aquifer
Upper Basin	4,633	1,216	7%	91	None to medium
Lower Basin	1,642	800	10%	80	Medium to high

Notes:
[a] Based on site reconnaissance and demographic data from the human health risk assessment (IDHW 2001a).
[b] Assumes 100 percent of residences outside water district service boundaries have private, unregulated sources.
[c] See Table 4-6 of the FS Part 2 (USEPA 2000c) for actual observed MCL exceedances. Lower Basin value applied to Kingston area because of small Kingston data set.

Table 12.1-11
Estimated Costs for Residential Soil

Area	Total Yards to Remediate	Barriers/ Partial Removals		Mobilization	Contingency[a]	Adminis-tration	Repository Cost	Drainage Upgrades	Recontam-ination	Total Present Worth Cost [b]
		No. of Yards	Estimated Cost							
Upper Basin	1,272	1,233	$18,578,816	$1,857,882	$9,093,509	$2,043,670	$2,031,597	$450,036	$2,552,828	$36,608,338
Lower Basin	107	102	$2,256,100	$225,610	$1,119,513	$248,171	$452,191	$518,903	$648,629	$5,469,116
Totals	**1,379**	**1,335**	**$20,834,916**	**$2,083,492**	**$10,213,022**	**$2,291,841**	**$2,483,788**	**$968,938**	**$3,201,457**	**$42,077,454**
Information and Intervention[c]										$1,358,000
Repository O&M Subtotal[d]										$200,000
Total										**$43,635,454**

[a] Contingency includes costs for potential relocation, which are estimated assuming 5% of homes to be remediated will be relocated at an average cost of $50,000 per residence plus costs for mobilization, contingency, and administration.

[b] Total estimated cost includes costs for 91 residences where soil cleanup has been completed, including 3 in Kingston area, 8 in Mullan, 22 in Osburn, 6 in Silverton, 40 in Wallace, and 12 in Canyon Creek area.

[c] Information and Intervention costs for residential areas are assumed to be equivalent to $1,358,000 of the total available funds for Information and Intervention for the Basin ($3,580,000).

[d] Assumes five Upper Basin and one Lower Basin repositories will be operational for 10 years, with one Upper Basin and one Lower Basin repositories remaining operational for 20 years following completion of cleanup actions. Costs for the repositories remaining operational for 10 years were assumed to be 10% of capital + mobilization costs for year 1, 5% for years 2 - 5, and 2.5% for years 6 - 10. Costs for continued operation were assumed to be 10% per year of the capital + mobilization costs for each of the two repositories for 20 years followed by a 10-year operation and maintenance period with costs estimated as 10% of capital + mobilization costs for year 21, 5% for years 22 - 25, and 2.5% for years 26 - 30.

Table 12.1-12
Estimated Costs for Street Rights of Way, Commercial Properties, and Common Areas

Area	Description	Estimated Present Worth Cost
Street Rights of Way	Assumes 1 foot depth of excavation and soil removal/replacement for $2/SF for approximately 8,000,000 SF of right-of-way (250 miles of road with 3-foot wide rights-of-way on both sides.	$16,000,000
Commercial Properties	Assumes 0.5 foot depth of excavation (1 foot depth next to sensitive receptors) and soil removal/replacement from 150 properties at a cost of $115,000/property.	$17,000,000
Common Areas	Assumes 1 foot depth of excavation and soil removal/replacement from 15 properties at a cost of $100,000/property.	$1,500,000
Information and intervention	Assume 6% of basin-wide Lead Health Intervention Program and 20% of basin-wide institutional controls program.	$310,000
Total Estimated Cost		$35,000,000

Notes:
All costs rounded to two significant figures.
O&M costs are assumed to be minimal for street rights of way, commercial properties, and common areas.

Table 12.1-13
Summary of Estimated Costs for House Dust

Recreation Area	Estimated Present Worth Capital Cost	Estimated Present Worth of O&M	Estimated Total Present Worth Cost
Skeel Gulch Beach	$176,000	$16,500	$192,500
Old Mission State Park	$176,000	$16,500	$192,500
Old Mission State Park Boat Launch	$176,000	$16,500	$192,500
Beach in Mission Flats	$176,000	$16,500	$192,500
South of Mission Flats	$176,000	$16,500	$192,500
Mouth of 4th of July Marsh	$176,000	$16,500	$192,500
Bull Run Peak Beach	$176,000	$16,500	$192,500
Rose Lake Access Area (includes East of Rose Lake and West of Rose Lake)	$254,800	$83,500	$338,300
East of Blackrock Gulch Marsh	$176,000	$16,500	$192,500
Beach Upstream from Quarry	$176,000	$16,500	$192,500
Quarry Beach	$176,000	$16,500	$192,500
RV Park across from Blackrock Gulch	$176,000	$16,500	$192,500
Blackrock Gulch Beach	$176,000	$16,500	$192,500
Beach below Ward Ridge	$176,000	$16,500	$192,500
Near East End of Killarney Lake	$176,000	$16,500	$192,500
Lane Beach	$176,000	$16,500	$192,500
Killarney Lake Boat Launch	$176,000	$16,500	$192,500
Beach near Canal to Killarney Lake	$176,000	$16,500	$192,500
RM 145	$176,000	$16,500	$192,500
Medimont (includes Boat Ramp, West Beach, and Hill Camping Area)	$233,300	$76,000	$309,300
Rainy Hill (includes Fishing Area and Picnic Area)	$233,300	$76,000	$309,300
West of Blue Lake	$176,000	$16,500	$192,500
RM 135 Long Beach/Springston	$176,000	$16,500	$192,500
Across River from Springston	$176,000	$16,500	$192,500
Springston Beach Site	$143,600	$47,000	$190,600
Thompson Lake	$217,300	$72,000	$289,300
Trestle Area next to Route 97	$176,000	$16,500	$192,500
Information and Intervention	$243,000	$0	$243,000
Total Estimated Present Worth Cost for Recreation Areas	**$5,200,000**	**$720,000**	**$5,900,000**

Table 12.1-14
Summary of Estimated Costs for House Dust

Area	Total Residences	Residences Affected	Direct Cost[a,b]	Mobilization 10%	Admin. 10%	Contingency 30%	Total Present Worth Cost[c]
Information and Intervention and Vacuum Loan Program/Dust Mats							
Lower Basin	1,642	575	$ 34,500	$ 3,450	$ 3,795	$11,385	$ 53,130
Upper Basin	4,633	3,180	$190,800	$19,080	$20,988	$62,964	$293,832
Subtotal	6,275	3,755	$225,300	$22,530	$24,783	$74,349	$346,962
Real-Time Monitoring Equipment							$ 7,400
Vacuum Loan Program							$ 16,000
35% of Lead Health Intervention Program costs. NPV@15 years, 7%.							$1,008,000
Subtotal, Information and Intervention and Vacuum Loan Program/Dust Mats							**$1,380,000**
Interior Source Removal/More Extensive Cleaning							
Lower Basin	1,642	39	$ 276,900	$ 27,690	$ 30,459	$ 91,377	$ 426,426
Upper Basin	4,633	227	$1,611,700	$161,170	$177,287	$531,861	$2,482,018
Subtotal	6,275	266	$1,888,600	$188,860	$207,746	$623,238	$2,908,444
Subtotal, Interior Source Removal/More Extensive Cleaning							**$2,908,444**
Total Estimated Cost for House Dust							**$4,288,000**

[a] Direct Cost for Information and Intervention and Vacuum Loan Program/Dust Mats = Number of residences affected times estimated cost for dust mats ($20) and testing ($40) for a total of $60 per residence. Testing costs assume sampling once per year for 5 years, every other year to 10 years, and only 1/5 of the total costs shared with other options.

[b] Direct Cost for Interior Source Removal/More Extensive Cleaning = The average of the average cost per house for HUD cleaning ($9,609) and the average cost per house for commercial cleaning ($4,548) as described in the *Interim Data Summary Report for Pre- and Post-Cleaning Results House Dust Pilot Project 2000*, prepared for the Idaho State Department of Environmental Quality by TerraGraphics Environmental Engineering, Inc., May 2001.

[c] Total Cost = Direct Cost (D) + Mobilization (M) + (D+M) times 10% + (D+M) times 30%.

Table 12.1-15
Summary of Estimated Costs for Drinking Water

Area	Inside or outside water district	Estimated no. of residences	Estimated present worth capital cost	Estimated present worth O&M cost	Estimated total present worth cost
Upper Basin	Inside[a]	3	$22,000	$0	$22,000
	Outside[b]	11	$39,000	$34,000	$73,000
Lower Basin (includes Kingston area)	Inside[a]	78	$580,000	$0	$580,000
	Outside[c]	79	$1,100,000	$70,000	$1,100,000
Information and intervention[d]			$430,000	$0	$430,000
Total		171	$2,100,000	$100,000	$2,200,000

Notes:
All costs rounded to two significant figures.
[a] Estimated costs based on connection to existing public water supply system.
[b] Estimated costs based on point-of-use treatment.
[c] Estimated costs based on installation of new drinking water supply well.
[d] Assumed to be 12% of the basinwide present worth information and intervention costs.

Table 12.1-16
Summary of Estimated Costs for Aquatic Food Sources

Description	Estimated Present Worth Capital Cost	Estimated Present Worth of O&M Costs	Estimated Total Present Worth Cost
Lead Health Intervention Program[a]	$230,000	$0	$230,000
Labor/Equipment/Materials[b]	$310,000	$0	$310,000
Fish Sampling[c]	$370,000	$0	$370,000
TOTAL	$910,000	$0	$910,000

[a] Estimated as 8% of the total present worth cost of the Lead Health Intervention Program ($2,880,000)
[b] Estimated as $25,000 annually for 30 years
[c] Estimated as $250,000 in year 0, $100,000 in year 5, and $100,000 in year 10.

Table 12.2-1
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area	Benchmark	Actions
Upper Basin	Reduce potential for recontamination of downstream remedies and reduce metals load to Coeur d'Alene Lake and the Spokane River	Stabilize stream beds and banks and dumps subject to erosion, implement runon/runoff controls, and construct sediment traps. Includes actions in Canyon Creek, Ninemile Creek, Pine Creek, and the South Fork.
	Reduce metals and nutrient loads from groundwater to the South Fork	Construct improvements to sewer and storm drain systems to reduce infiltration of contaminated groundwater.
Estimated costs for stabilization actions are included under the watershed where the action would take place. Costs for sewer and storm drain improvements would not be eligible for funding under CERCLA unless necessary to conduct or maintain remedy (the estimated cost for these improvements = $12,000,000)		
Canyon Creek	Reduce metals toxicity to downstream aquatic receptors Reduce dissolved metals load discharging to the South Fork by at least 50%[a]	Pilot and demonstration projects for treatment of creek water and groundwater near the mouth (permeable reactive barrier (PRB) or other technology, potentially including active technology components). Implement water treatment or other technology based on outcome of demonstration project.
	Reduce particulate lead and sediment loading during high flows	Conduct stabilization of stream banks and dumps (e.g., Tamarack, Omaha, Standard-Mammoth Loading Area, Hercules No. 5)
	Protect recreational users at mine and mill sites	Address mine/mill sites with human health exposures (Standard-Mammoth Mill, Sisters Mine, and Burke concentrator) using a combination of access controls, capping and removals
Estimated Total Present Worth Cost = $35,000,000		

Table 12.2-1 (Continued)
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area		Benchmark	Actions
Ninemile Creek	East Fork headwaters to above Success	**Improve conditions to allow natural reestablishment of a salmonid fishery** Tier 2 to 3+ fishery (see fishery tier definitions at end of table). Reestablish fishery in 1.7 miles of 13 miles of streams in the Basin that are devoid of fish. Reduce dissolved metals concentrations to less than 7 times chronic AWQC with mitigation of mining impacts on riverine areas. (AWQC are shown in Table 8.2-2) **Protect riverine and riparian receptors** Mitigate mining impacts on riparian areas along 1.7 miles of stream. Risks to riparian receptors will be mitigated using removal and replacement with clean soil or capping with clean soil to isolate contaminants and reduce or eliminate exposure pathways.	Implementation of a remedy upstream of the Success based on Alternative 3: • All significant loading sources would be removed, contained, or treated (all except upland waste rock without erosion or leaching potential and adits discharging metals at concentrations <AWQC) • Impacted sediments and tailings placed in onsite or regional repository • Tailings impoundments provided with low-permeability cap • Waste rock subject to erosion or leaching consolidated and contained above the floodplain • Treatment of water from seeps and five adits • Hydraulic controls/treatment as needed for loads that are not controlled by removal or containment • Bioengineering to stabilize stream beds and banks to mitigate mining impacts on riverine and riparian zones Potential additional actions at the Rex and Interstate mill sites, if needed to achieve benchmarks
	East Fork above Success to confluence	**Improve conditions to allow natural reestablishment of a migratory corridor for adult and juvenile fish** Tier 1 fishery. Reduce dissolved metals concentrations to less than 20 times acute AWQC. (AWQC are shown in Table 8.2-2)	Complete implementation of remedy at Success. Continue monitoring of Success. Based on the results of monitoring, additional actions may be required in this reach, potentially including partial or complete removal of the Success tailings and treatment of creek water near the mouth (permeable reactive barrier (PRB) or other technology, potentially including active treatment components).

Table 12.2-1 (Continued)
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area		Benchmark	Actions
Ninemile Creek	Mainstem Ninemile Creek.	**Improve conditions to allow natural reestablishment of an adult salmonid fishery** Tier 1 fishery. Reduce dissolved metals concentrations to less than 20 times acute AWQC. (AWQC are shown in Table 8.2-2) **Protect recreational users at mine and mill sites**	Benchmarks would be achieved through actions taken upstream in East Fork. Bioengineering actions may be implemented by other agencies under other programs. Costs for these actions are not included in the estimated costs for Ninemile Creek. Remediate Day Rock mine and mill site using a combination of access controls, capping and removals
Estimated Total Present Worth Cost = $13,500,000 to $36,000,000 (upper range includes additional actions at Success, Rex, and Interstate and treatment of East Fork creek water)			
Pine Creek		**Improve conditions to allow natural increases in salmonid populations and improve spawning and rearing** Tier 3+ fishery. **Protect riverine and riparian receptors** Mitigate mining impacts on riparian areas at locations of hot spot removal/capping. Risks to riparian receptors will be mitigated using removal and replacement with clean soil or capping with clean soil to isolate contaminants and reduce or eliminate exposure pathways. **Protect recreational users at mine and mill sites** including Upper and Lower Constitution Mine and Mill, Highland Surprise Mine and Mill, Nevada Stewart Mine, Hilarity Mine and Mill	Bank and bed stabilization and riparian zone revegetation, with remaining hot spot removals, including Upper and Lower Constitution Mine and Mill, Highland Surprise Mine and Mill, Nevada Stewart Mine, Hilarity Mine and Mill, and Little Pittsburg, Sidney on Denver Creek, and Nabob. Based on results of monitoring, remedy may include treatment of Denver Creek near its mouth to reduce metals load. Improve stream to mitigate environment impacts from mining, including regrading of stream reaches that go dry in the summer months.

Table 12.2-1 (Continued)
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area	Benchmark	Actions
Estimated Total Present Worth Cost = $14,000,000		
South Fork (above Elizabeth Park)	**Improve conditions to support a higher fish density** Tier 2+ to 3+ fishery at >0.1 fish/square meter **Initial protection of riverine and riparian receptors** Mitigate mining impacts on riparian areas at locations of hot spot removal/capping. Risks to riparian receptors will be mitigated using removal and replacement with clean soil or capping with clean soil to isolate contaminants and reduce or eliminate exposure pathways. **Protect recreational users at mine and mill sites**	Stabilize and bioengineer stream channel and banks to protect riverine and riparian receptors, with associated hot-spot removals in upper floodplain. Address mine/mill sites with human health exposures (National Mill, Morning No. 6, Golconda, Hercules Mill, Coeur d'Alene Mill, USBM impoundment, and Silver Dollar Mine) using a combination of access controls, capping, and removals
Estimated Total Present Worth Cost = $16,000,000		
South Fork (Elizabeth Park to confluence including the Bunker Hill Box)	**Reduce metals loading to surface water**	Hydrogeologic investigation: surface water and groundwater monitoring and modeling. Coordination with remedial activities within the Box, which includes actions such as controlling loads to surface water from the CIA area and upgrading the central treatment plant (CTP)[b] Development of groundwater remedy alternatives.
Future actions in the Box are not part of this Selected Remedy.		

[b] Remedial actions for Bunker Hill Box are addressed in the separate Records of Decision (RODs) for this area.

Table 12.2-1 (Continued)
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area	Benchmark	Actions
Lower Basin Stream Banks and Beds, including the Harrison Delta (Riparian and Riverine)	**Reduce particulate lead loading in the river** Reduce lead load entering into Lake Coeur d'Alene and the Spokane River, with emphasis on peak discharge events. Estimated reduction in high-flow load needed is at least 50% to reduce year-round lead concentrations to below chronic AWQC in the Spokane River. **Reduce soil toxicity for songbirds, small mammals, and riparian plants** Mitigate risks to riparian receptors along 33.4 miles of river by removing contaminated bank wedges from a 30-foot wide zone (122 acres). Remove contaminated bank wedges and cap with clean topsoil to enhance vegetation establishment and isolate contaminants from receptors. **Reduce human exposure (recreational and subsistence users)** Same as goals for soil and dust under communities and residential areas	The goal is to implement complete removal of contaminated bank wedges from highly-erosive areas.[c] Where complete removal is not feasible, partial removal may be followed by capping with clean topsoil to enhance vegetation establishment and isolate contaminants from receptors. Stabilize banks and revegetate removal areas to protect riparian zone ecological receptors and humans. Construct and operate sediments traps at four splay areas where the river overflows its banks during high flow conditions (Frutchey's field, Black Rock Slough, Strobl Marsh, and Medicine Lake) after implementing pilot study at one area. Implement periodic removal of river bed sediments in Dudley reach or other natural depositional areas identified during remedial design.[d]
Estimated Total Present Worth Cost = $71,000,000		

[c] Areas identified as requiring aggressive actions. Costs based on 176,383 lf (33.4 miles) with 2.3 cy/lf (approximately 30-feet wide).
[d] Assumes 500,000 cy initial removal and 200,000 cy after 5, 10, 15 and 20 years (total of 1.3 million cubic yards). It is EPA's intent to increase the removal of riverbed sediments in the Dudley reach of the Coeur d'Alene River to up to 1,000,000 cy initial removal and 400,000 cy after 5, 10, 15, and 20 years for a total of up to 2.6 million cubic yards. Based on current unit costs, this would increase the estimated total cost by approximately $26 million.

Table 12.2-1 (Continued)
Summary of the Selected Remedy for Ecological Protection in the Upper Basin and Lower Basin

Area	Benchmark	Actions
Lower Basin Floodplain	**Wetlands: Reduce sediment toxicity and waterfowl mortality** Increase feeding area with lead concentration <530 mg/kg by 1,169 acres (of a total of 5,829 wetland acres with lead exceeding 530 mg/kg). Potentially increase feeding area by an additional 1,500 acres through conversion of agricultural land. **Lakes: Reduce sediment toxicity to diving ducks, dabbling ducks, and warm- and cold-water fishes** Reduce lead concentration in whole brown bullhead fish (as an indicator species) by remediating 1,859 of 5,979 acres of lake with lead exceeding 530 mg/kg. **Riparian: Reduce soil toxicity for riparian receptors** **Reduce human exposure (recreational and subsistence users)** Same as goals for soil and dust under communities and residential areas.	Reduce exposure using a combination of removals, capping, and soil amendments in areas of high waterfowl use, high lead, road access, and relatively low recontamination potential. Human health concerns would also be addressed in identified areas. These areas are: Lane Marsh (south of railroad ROW) (wetland: 213 acres) Medicine Lake (wetland: 198 acres, lake: 230 acres) Cave Lake (wetland: 190 acres, lake: 746 acres) Bare Marsh (wetland: 165 acres) Thompson Lake (wetland: 300 acres, lake: 256 acres); Thompson Marsh (wetland 59 acres, lake: 122 acres) Anderson Lake (wetland 44 acres, lake: 505 acres). Identify agricultural and other areas (subject to landowner approval and further sampling) with lower levels of lead for cleanup to provide additional clean feeding areas (6 areas = 1500 acres).
Estimated Total Present Worth Cost = $81,000,000		

Fishery Tier definitions:
Tier 0: No migrating or resident fish observed.
Tier 1: Presence of migrating fish only, no fish observed during resident fish surveys (expected to be achieved at concentrations below 20x acute AWQC).
Tier 2: Presence of resident salmonids (trout) of any species, sculpin absent (expected to be achieved at concentrations from 7x to 10x chronic AWQC).
Tier 3: Presence of 3 or more year classes of resident salmonids, including young of the year (YOY), sculpin absent (expected to be achieved at concentrations between 3x and 7x chronic AWQC).

Table 12.2-2
Summary of Anticipated Fisheries Status After Implementation of the Selected Remedy

Area	Fishery Benchmark [a]	Current Water Chemistry and Physical Conditions						Water Chemistry and Physical Conditions Necessary to Achieve Benchmark						Notes
		AWQC ratio [b]	Width/ Depth Ratio [c]	Residual Pool Volume [d] (ft^3/mile)	Percent Shade [e]	Large Woody Debris [f] (/100m)	Temperature [g]	AWQC Ratio [b]	Width/ Depth Ratio [c]	Residual Pool Volume [d] (ft^3/mile)	Percent Shade [e]	Large Woody Debris [f] (/100m)	Temperature [g]	
East Fork Ninemile Creek above Success	Improve conditions to allow natural reestablishment of an adult salmonid fishery (Tier 3+)	50x	21 to 35	1,600	35	30 to 50	NR	<7x	10 to 15	>3,500	>60	30 to 50	3	• Rehabilitation of physical features needed to support fishery achieved under the selected remedy. • Marginal evidence for persistence of native trout populations at 10x chronic AWQC. Probability of success increases if concentrations are reduced below 7x chronic AWQC. • Evidence of native trout populations present above the Interstate Mill site as of 1995.
East Fork Ninemile Creek from confluence with mainstem to Success	Improve conditions to allow establishment of a migratory corridor for adult and juvenile fish (Tier 1).	100x	21 to 35	1,600	35	30 to 50	NR	20x	None*	None*	None*	None*	None*	• No physical conditions issues are addressed by the remedy in this area of the watershed. However, minimal improvements are necessary to provide a migratory corridor. • Other agencies may take additional actions under other programs that are consistent with the overall goals of the selected remedy. • Adult fish migration observed at high flow concentrations exceeding 20x acute AWQC in Canyon Creek • High flow bypass of any reactive barrier would need to allow fish passage.
Mainstem Ninemile Crk.	Improve conditions to allow establishment of a migratory corridor (Tier 1)	50x	15	1,600	15	NR	0 to 1	20x	None*	None*	None*	None*	None*	• No physical conditions issues are addressed under remedy. Summer temperatures reduced somewhat by bioengineering actions above Success. • Physical constraints are limiting to establishment of a resident. • Other agencies may take additional actions under other programs that are consistent with the overall goals of the selected remedy.
East Fork Pine Creek below Douglass Creek	• Improve conditions to allow natural increases in salmonid populations (Tier 3+ fishery). • Improve spawning and rearing habitat	10 to 20x	64	2,200	34	42	3*	<7x	18	>6,000	>60	40 to 50	3	• Existing physical conditions issues have been partially addressed by BLM cleanup actions. Additional bioengineering with riparian revegetation should remediate physical conditions • Fishery is currently Tier 2, dominated by introduced brook trout. • Existing densities are generally low (<0.05 fish/m^2).

Table 12.2-2 (Continued)
Summary of Anticipated Fisheries Status After Implementation of the Selected Remedy

Area	Fishery Benchmark [a]	Current Water Chemistry and Physical Conditions						Water Chemistry and Physical Conditions Necessary to Achieve Benchmark						Notes
		AWQC ratio [b]	Width/ Depth Ratio [c]	Residual Pool Volume [d] (ft^3/mile)	Percent Shade [e]	Large Woody Debris [f] (/100m)	Temperature [g]	AWQC Ratio [b]	Width/ Depth Ratio [c]	Residual Pool Volume [d] (ft^3/mile)	Percent Shade [e]	Large Woody Debris [f] (/100m)	Temperature [g]	
Mainstem Pine Creek	Same as above	1x to 3x	42	13,000	16	NR	3	<7x	NR	NR	>33	NR	3	• Floodplain removals include limited bioengineering. Some physical conditions issues may not be fully addressed. • Fishery is currently Tier 3+, dominated by introduced brook trout. • Much of mainstem in Pinehurst is channelized which will limit fishery productivity. • Limiting stream temperatures were not observed during monitoring on mainstem.
South Fork – Wallace to Elizabeth Park	Improve conditions to support a higher fish density (Tier 2+ to 3+ at >0.10 fish/m^2)	10x to 20x	34 to 64	1,500	16	<1	1	<7x	<50	>100,000	>30	>80	2	• Hot-spot removal with associated bank stabilization and riparian planting will address <10% of river length. • Trout are present at Tier 2 to Tier 3 levels in the South Fork, but at low densities (<0.01 fish/m^2). • Physical conditions are limiting to fish populations throughout this area. • AWQC ratio reductions will primarily be achieved by actions in Ninemile and Canyon Creeks.

[a] Fishery Tier definitions:
Tier 0: No migrating or resident fish observed.
Tier 1: Presence of migrating fish only, no fish observed during resident fish surveys (concentrations below 20x acute AWQC).
Tier 2: Presence of resident salmonids (trout) of any species sculpin absent (Expected to be achieved of concentrations from 7x to 10x chronic AWQC).
Tier 3: Presence of 3 or more year classes of resident salmonids, including young of the year (YOY), sculpin absent (Expected to be achieved of concentrations between 3x and 7x chronic AWQC).
Tier 4: Presence of 3 or more year classes of resident salmonids, including YOY, and sculpin (Expected to be achieved of concentrations between 1x and 3x chronic AWQC).
Tier 5: Presence of 5 salmonid age classes, including YOY, sculpin, and bull trout. Fauna dominated by native species at high densities (0.1 to >0.3 fish/m^2) (least impacted watersheds with concentrations <1x chronic AWQC).
+ presence of adult trout (>150mm).

[b] AWQC ratios are the measured concentrations of cadmium and zinc rounded to multiples of chronic Ambient Water Quality Criteria (AWQC). Chronic AWQC thresholds are calculated based on a hardness of 70 mg/L as $CaCO_3$. For the definition of fisheries tiers, AWQC are equal to the EPA-approved State of Idaho water quality standards for cadmium and zinc (see Tables 8.2-2 and 8.2-3). The concentration ranges are unaffected by the 2001 update to the cadmium criteria.
[c] Width to depth ratio is the ratio of wetted channel width to wetted channel depth.
[d] Residual pool volume data has not been resolved due to discrepancies in the available data for assessment and reference areas.
[e] Percent shade measured as average percent channel canopy closure (IDEQ 1998).
[f] Large woody debris defined as pieces at least 1 m long and 10cm diameter (IDEQ 1998).

Table 12.2-2 (Continued)
Summary of Anticipated Fisheries Status After Implementation of the Selected Remedy

[g] **Temperature Rating definitions:**
0: Temperatures exceed high adverse effects level threshold.
1: Temperatures exceed moderate adverse effects level threshold.
2: Temperatures exceed low adverse effects level threshold.
3: Temperatures do not exceed adverse level thresholds.

Source: Coeur d'Alene Basinwide Ecological Risk Assessment, Appendix K

Notes:
NR: Indicates data are available but discrepancies have not been resolved.
-: Indicates data are not available.
***: No area-specific actions for this parameter are believed necessary to achieve benchmark.**

Table 12.2-3
Summary of Estimated Costs for Ninemile Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
EAST FORK NINEMILE ABOVE SUCCESS									
ACCESSNM01	Access roads Seg01		Temporary Access Road	0.5	MI	$200,000	$100,000	$60,000	$0
ACCESSNM02	Access roads Seg02		Temporary Access Road	1.25	MI	$200,000	$250,000	$150,000	$0
BUR051	Sunset Mine	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
BUR051	Sunset Mine	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
BUR052	Little Sunset Mine	Waste Rock	Excavation	800	CY	$2.70	$2,160	$1,296	$0
BUR052	Little Sunset Mine	Waste Rock	Low Permeability Cap	0.16	AC	$151,000	$24,160	$14,496	$3,020
BUR053	Interstate Rock Dumps	Waste Rock	Low Permeability Cap	8.45	AC	$170,000	$1,436,500	$861,900	$323,213
BUR053	Interstate Rock Dumps	Waste Rock	Excavation	138,400	CY	$2.70	$373,680	$224,208	$0
BUR054	Rex No. 2	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1.085
BUR054	Rex No. 2	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
BUR056	Tamarack Rock Dump	Waste Rock	Regrade/Consolidate/Revegetate	13.34	AC	$110,000	$1,467,400	$880,400	$183,425
BUR058	Tamarack No. 3	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
BUR058	Tamarack No. 3	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
BUR139	Rex No. 1	Waste Rock	Low Permeability Cap	1.31	AC	$151,000	$197,810	$118,686	$24,726
BUR140	Impacted riparian	Floodplain Sediments	Sediment Excavation	10,000	CY	$10	$100,000	$60,000	$0
BUR140	Impacted riparian	Floodplain Sediments	Regional Repository	10,000	CY	$16	$160,000	$96,000	$40,000
BUR160	Interstate Lower Dump	Waste Rock	Low Permeability Cap	4.2	AC	$170,000	$714,000	$428,400	$160,650
BUR170	Tamarack 400 Level	Waste Rock	Low Permeability	0.95	AC	$151,000	$143,450	$86,070	$17,931
BUR170	Tamarack 400 Level	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
BUR170	Tamarack 400 Level	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
BUR171	Tamarack No. 5	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
BUR171	Tamarack No. 5	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
BUR171	Tamarack No. 5	Waste Rock	Low Permeability Cap	0.66	AC	$151,000	$99,660	$59,796	$12,458
BUR172	Tamarack Unnamed Adit	Waste Rock	Low Permeability Cap	0.43	AC	$151,000	$64,930	$38,958	$8,116
OSB056	Impacted riparian	Floodplain Sediments	Sediment Excavation	1,600	CY	$10	$16,000	$9,600	
OSB056	Impacted riparian	Floodplain Sediments	Regional Repository	1,600	CY	$16	$25,600	$15,360	$6,400
OSB039	Day Rock	Upland Tailings	Excavation	11,000	CY	$2.70	$29,700	$17,820	$0
OSB039	Day Rock	Floodplain Sediments	Sediment Excavation	11,000	CY	$10	$110,000	$66,000	$0
OSB039	Day Rock	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
OSB039	Day Rock	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
OSB039	Day Rock	Floodplain Sediments	Regional Repository	11,000	CY	$16	$176,000	$105,600	$44,000

Table 12.2-3 (Continued)
Summary of Estimated Costs for Ninemile Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
OSB039	Day Rock	Upland Tailings	Local Repository Above Flood Level	11,000	CY	$9.70	$106,700	$64,020	$24,008
OSB039	Day Rock	Buildings & Structures	Decon Millsite	1	LS	$100,000	$100,000	$60,000	$5,000
LHAULNM02	Haul to local repository, Seg02		Haul to Local Repository	7,000	CY-MI	$0.89	$6,230	$3,738	$0
NM01-1	Headwaters to Interstate millsite reach		Current Deflector Sediment Traps	5	EA	$1,380	$6,900	$4,140	$40,020
NM01-1	Headwaters to Interstate millsite reach		Vegetative Bank Stabilization	4,011	LF	$36	$144,396	$86,638	$43,319
NM01-1	Headwaters to Interstate millsite reach		Bank Stabilization via Revetments	4,011	LF	$83	$332,913	$199,748	$99,874
NM01-1	Headwaters to Interstate millsite reach		Floodplain & Riparian Replanting	200,531	SF	$0.94	$188,499	$113,099	$32,987
NM01-1	Headwaters to Interstate millsite reach		Current Deflector	48	EA	$1,380	$66,240	$39,744	$19,872
NM02-1	Interstate millsite to Success reach		Current Deflector	45	EA	$1,380	$62,100	$37,260	$18,630
NM02-1	Interstate millsite to Success reach		Vegetative Bank Stabilization	3,777	LF	$36	$135,954	$81,572	$40,786
NM02-1	Interstate millsite to Success reach		Bank Stabilization via Revetments	3,777	LF	$83	$313,450	$188,070	$94,035
NM02-1	Interstate millsite to Success reach		Floodplain & Riparian Replanting	188,828	SF	$0.94	$177,498	$106,499	$31,062
NM02-1	Interstate millsite to Success reach		Off-Channel Hydrologic Feature	188,828	SY	$29	$5,032	$3,019	$881
NM02-1	Interstate millsite to Success reach		Current Deflector Sediment Traps	10	EA	1,380	$6,900	$4,100	$40,020
RHAULNMO1	Haul to Regional Repository, Seg01		Haul to Regional Repository	81,200	CY-MI	$0.89	$72,268	$43,361	$0
								Capital Cost	**$ 12,000,000**
								O&M Cost	**$ 1,500,000**
								Total Cost	**$ 13,000,000**
CONTINGENCY COSTS									
Rex									
BUR055	Rex	Waste Rock	Low Permeability Cap	5	AC	$151,000	$755,000	$453,300	$94,375
BUR055	Rex	Upland Tailings	Tailings Impoundment Closure	6.5	AC	$170,000	$1,105,000	$663,000	$221,000
								Capital	$ 2,976,300
								O&M	$ 315,375
								Total	$ 3,291,675
Interstate Millsite									
BUR055	Interstate Millsite	Floodplain Sediments	Regional Repository	5500	CY	$16	$88,000	$52,800	$22,000
BUR055	Interstate Millsite	Upland Tailings	Local Repository Above Flood Level	14000	CY	$9.70	$135,800	$81,400	$30,555
BUR055	Interstate Millsite	Floodplain Sediments	Sediment Excavation	5500	CY	$10	$55,000	$33,000	$0
								Capital	$ 446,080
								O&M	$ 52,555
								Total	$ 498,635

Table 12.2-3 (Continued)
Summary of Estimated Costs for Ninemile Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Success									
OSB044	Success	Floodplain Sediments	Regional Repository	10,000	CY	$16	$160,000	$96,000	$40,000
OSB044	Success	Upland Tailings	Excavation	360,000	CY	$2.70	$972,000	$583,200	$0
OSB044	Success	Waste Rock	Regrade/Consolidate/Revegetate	0.45	AC	$56,000	$25,200	$15,120	$3,150
OSB044	Success	Upland Tailings	Regional Repository	360,000	CY	$16	$5,760,000	$3,456,000	$1,440,000
OSB044	Success	Floodplain Sediments	Sediment Excavation	10,000	CY	$10	$100,000	$60,000	$0
								Capital	$ 11,227,520
								O&M	$ 1,483,150
								Total	$ 12,710,670
East Fork Ninemile Treatment Pond (See Note 1)									
	Ninemile Treatment Pond (10 cfs)		Reagent	1,603	TON	$600	$961,696	$577,018	$1,906,005
	Ninemile Treatment Pond (10 cfs)		Other Construction and Monitoring	1	LS	$1,123,089	$1,123,089	$673,853	$762,402
								Capital	$ 3,335,656
								O&M	$ 2,668,407
								Total	$ 6,004,063
								Total Contingency Capital Cost	**$18,000,000**
								Total Contingency O&M Cost	**$ 4,500,000**
								Total Contingency Cost	**$23,000,000**
								TOTAL CAPITAL COST	**$30,000,000**
								TOTAL O&M COST	**$ 6,000,000**
								TOTAL COST	**$36,000,000**

Note 1: Estimated costs for treatment pond are based on the assumption that 70% of the upstream metal load in Ninemile Creek is removed by source-specific remedial actions.

Table 12.2-4
Summary of Estimated Costs for Pine Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Human Health at Mine and Mill Sites									
MAS027	L. Const. Mine	Floodplain Waste Rock	Low Permeability Cap	2.42	AC	$151,000	$365,420	$219,252	$45,678
MAS027	L. Const. Mine	Floodplain Waste Rock	Excavation	7,000	CY	$2.70	$18,900	$11,340	$0
MAS048	L. Const. Mine	Floodplain Tailings	Excavation	4,950	CY	$2.70	$13,365	$8,019	$0
MAS048	L. Const. Mine	Floodplain Tailings	Local Repository Above Flood Level	4,950	CY	$9.70	$48,015	$28,809	$10,803
MAS048	L. Const. Mine	Upland Tailings	Local Repository Above Flood Level	16,320	CY	$9.70	$158,304	$94,982	$35,618
MAS048	L. Const. Mine	Upland Tailings	Excavation	16,320	CY	$2.70	$44,064	$26,438	$0
MAS049	U. Const. Tailings	Floodplain Tailings	Local Repository Above Flood Level	36,000	CY	$9.70	$349,200	$209,520	$78,570
MAS049	U. Const. Tailings	Floodplain Tailings	Excavation	36,000	CY	$2.70	$97,200	$58,320	$0
MAS050	U. Const. WRP	Floodplain Waste Rock	Excavation	10,500	CY	$2.70	$28,350	$17,010	$0
MAS050	U. Const. WRP	Floodplain Waste Rock	Low Permeability Cap	1.5	AC	$151,000	$226,500	$135,900	$39,638
MAS022	H-S Upper WRP	Floodplain Waste Rock	Excavation	48,000	CY	$2.70	$129,600	$77,760	$0
MAS022	H-S Upper WRP	Floodplain Waste Rock	Local Repository Above Flood Level	48,000	CY	$9.70	$465,600	$279,360	$104,760
MAS078	H-W Mine/mill	Adit Drainage	Permeable Reactive Trench	0.583	LB/DAY	$13,903	$8,109	$4,866	$48,656
MAS078	H-W Mine/mill	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS079	H-S Lower WRP	Floodplain Waste Rock	Excavation	3,300	CY	$2.70	$100,710	$60,426	$0
MAS079	H-S Lower WRP	Floodplain Waste Rock	Low Permeability Cap	1.9	AC	$151,000	$286,900	$172,140	$35,863
MAS021	Nev-Stewart	Adit Drainage	Permeable Reactive Trench	3.888	LB/DAY	$13,903	$54,060	$32,436	$324,359
MAS021	Nev-Stewart	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS021	Nev-Stewart	Upland Waste Rock	Low Permeability Cap	0.63	AC	$170,000	$107,100	$64,260	$24,098
MAS021	Nev-Stewart	Upland Waste Rock	Excavation	200	CY	$2.70	$540	$324	$0
MAS014	Hilarity	Upland Tailings	Excavation	80	CY	$2.70	$216	$130	$0
MAS014	Hilarity	Upland Tailings	Regional Repository	80	CY	$16	$1,280	$768	$320
MAS014	Hilarity	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
MAS014	Hilarity	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS041	Hilarity	Seep	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
MAS007	Nabob Mine	Upland Waste Rock	Excavation	48,000	CY	$2.70	$129,600	$77,760	$0
MAS007	Nabob Mine	Upland Waste Rock	Low Permeability Cap	1.82	AC	$151,000	$274,820	$164,892	$34,353
MAS007	Nabob Mine	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS007	Nabob Mine	Adit Drainage	Permeable Reactive Trench	2.1	LB/DAY	$13,903	$29,412	$17,647	$176,475

Table 12.2-4 (Continued)
Summary of Estimated Costs for Pine Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
								Capital	$ 4,800,000
								O&M	$ 1,000,000
								Total	$ 5,800,000
Ecological Protection at Mine and Mill Sites									
MAS015	Little Pittsburg Lower Mine	Upland Waste Rock	Local Repository Above Flood Level	1,000	CY	$9.70	$9,700	$5,820	$2,183
MAS015	Little Pittsburg Lower Mine	Upland Waste Rock	Excavation	1,000	CY	$2.70	$2,700	$1,620	$0
MAS015	Little Pittsburg Lower Mine	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
MAS015	Little Pittsburg Lower Mine	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS016	Little Pittsburg Lower Mine	Adit Drainage	Permeable Reactive Trench	1	LS	$4,400	$4,400	$2,640	$26,400
MAS016	Little Pittsburg Lower Mine	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS016	Little Pittsburg Lower Mine	Upland Waste Rock	Local Repository Above Flood Level	23,280	CY	$9.70	$225,816	$135,490	$50,809
MAS016	Little Pittsburg Lower Mine	Upland Waste Rock	Excavation	23,280	CY	$2.70	$62,856	$37,714	$0
MAS017	Sidney (Denver)	Upland Waste Rock	Excavation	62,640	CY	$2.70	$169,128	$101,477	$0
MAS017	Sidney (Denver)	Upland Waste Rock	Local Repository Above Flood Level	62,640	CY	$9.70	$607,608	$364,565	$136,712
MAS020	Sidney Mine/Millsite	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MAS020	Sidney Mine/Millsite	Adit Drainage	Permeable Reactive Trench	4.2	LB/DAY	$13,903	$58,838	$55,421	$147,790
			Haul to Local Repository	96,095	CY-MI	$0.89	$85,525	$51,315	$0
								Capital	$ 2,000,000
								O&M	$ 400,000
								Total	$ 2,400,000
Bioengineering									
PC03-1	E.Fork/W.Fork conf to unnamed		Bank Stabilization via Revetments	2,032	LF	$83	$168,656	$101,194	$50,597
PC03-2	unnamed to unnamed		Bank Stabilization via Revetments	1,649	LF	$83	$136,867	$82,120	$41,060
PC03-3	unnamed to Little Pine Creek		Bank Stabilization via Revetments	1,000	LF	$83	$83,000	$49,800	$24,900
PC03-1	E.Fork/W.Fork conf to unnamed		Floodplain and Riparian Replanting	232,739	SF	$0.94	$218,775	$131,265	$38,286
PC03-2	unnamed to unnamed		Floodplain and Riparian Replanting	181,335	SF	$0.94	$170,455	$102,273	$29,830
PC03-3	unnamed to Little Pine Creek		Floodplain and Riparian Replanting	284,463	SF	$0.94	$267,395	$160,437	$46,794
PC03-1	E.Fork/W.Fork conf to unnamed		Vegetative Bank Stabilization	2,032	LF	$36	$73,152	$43,891	$21,946
PC03-2	unnamed to unnamed		Vegetative Bank Stabilization	1,649	LF	$36	$59,364	$35,618	$17,809
PC03-3	unnamed to Little Pine Creek		Vegetative Bank Stabilization	1,000	LF	$36	$36,000	$21,600	$10,800
PC01-3	Constitution to unnamed		Floodplain and Riparian Replanting	137,280	SF	$0.94	$129,043	$77,426	$22,583
PC01-4	unnamed to Douglas		Floodplain and Riparian Replanting	203,280	SF	$0.94	$191,083	$114,650	$33,440
PC01-5	Douglas to Dry		Floodplain and Riparian Replanting	1,24,080	SF	$0.94	$116,635	$69,981	$20,411

Table 12.2-4 (Continued)
Summary of Estimated Costs for Pine Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
PC01-6	Dry to Blue Eagle		Floodplain and Riparian Replanting	47,520	SF	$0.94	$44,669	$26,801	$7,817
PC01-7	Blue Eagle to Highland		Floodplain and Riparian Replanting	126,720	SF	$0.94	$119,117	$71,470	$20,845
PC01-8	Highland to Denver		Floodplain and Riparian Replanting	166,320	SF	$0.94	$156,341	$93,804	$27,360
PC01-9	Denver to Hunter		Floodplain and Riparian Replanting	163,680	SF	$0.94	$153,859	$92,316	$26,925
PC01-10	Hunter to unnamed		Floodplain and Riparian Replanting	36,960	SF	$0.94	$34,742	$20,845	$6,080
PC01-11	unnamed to Nabob		Floodplain and Riparian Replanting	47,520	SF	$0.94	$44,669	$26,801	$7,817
PC01-12	Nabob to West Fork		Floodplain and Riparian Replanting	343,200	SF	$0.94	$322,608	$193,565	$56,456
Bioengineering (Continued)									
PC01-3	Constitution to unnamed		Current Deflector	37	EA	$1,380	$51,060	$30,636	$15,318
PC01-4	unnamed to Douglas		Current Deflector	54	EA	$1,380	$74,520	$44,712	$22,356
PC01-5	Douglas to Dry		Current Deflector	33	EA	$1,380	$45,540	$27,324	$13,662
PC01-6	Dry to Blue Eagle		Current Deflector	13	EA	$1,380	$17,940	$10,764	$5,382
PC01-7	Blue Eagle to Highland		Current Deflector	34	EA	$1,380	$46,920	$28,152	$14,076
PC01-8	Highland to Denver		Current Deflector	44	EA	$1,380	$60,720	$36,432	$18,216
PC01-9	Denver to Hunter		Current Deflector	44	EA	$1,380	$60,720	$36,432	$18,216
PC01-10	Hunter to unnamed		Current Deflector	10	EA	$1,380	$13,800	$8,280	$4,140
PC01-11	unnamed to Nabob		Current Deflector	13	EA	$1,380	$17,940	$10,764	$5,382
PC01-12	Nabob to West Fork		Current Deflector	92	EA	$1,380	$126,960	$76,176	$38,088
								Capital	$ 4,900,000
								O&M	$ 700,000
								Total	$ 5.600,000
								Capital	**$ 12,000,000**
								O&M	**$ 2,100,000**
								Total	**$ 14,100,000**

Table 12.2-5
Summary of Estimated Costs for Canyon Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Human Health at Mine and Mill Sites									
WAL039	SM Mill	Upland Tailings	Excavate/Dispose in Regional Landfill	12,500	CY	$18.50	$231,250	$138,750	$0
WAL039	SM Mill	Upland Tailings	General Grading	10,000	CY	$2	$20,000	$12,000	$2,500
WAL039	SM Mill	Upland Tailings	Cap - General	3,500	CY	$16.50	$57,750	$34,650	$7,219
WAL039	SM Mill	Upland Tailings	Upland Revegetation	2	AC	$5,000	$10,000	$6,000	$1,250
WAL039	SM Mill	Floodplain Sediments	Wetland Vegetation	3	AC	$11,000	$33,000	$19,800	$5,775
WAL039	SM Mill	Floodplain Sediments	Upland Revegetation	1	AC	$5,000	$5,000	$3,000	$625
WAL039	SM Mill	Floodplain Sediments	Bioengineering Streambanks	2,300	LF	$40	$92,000	$55,200	$27,600
WAL008	Sisters	Upland Waste Rock	Excavate/Dispose in Regional Landfill	5,000	CY	$18.50	$92,500	$55,500	$0
WAL008	Sisters	Upland Waste Rock	Upland Revegetation	0.6	AC	$5,000	$3,000	$1,800	$375
WAL008	Sisters	Upland Waste Rock	General Grading	2,000	CY	$2	$4,000	$2,400	$500
BUR128	Burke Concentrator	Buildings & Structures	No Actions identified				$0	$0	$0
								Capital	$ 880,000
								O&M	$ 50,000
								Total	$ 930,000
Dump and Bank Stabilization									
BUR067	Tamarack 7\WRP	Upland Waste Rock	Bioengineering Steambanks	1,000	LF	$40	$40,000	$24,000	$12,000
BUR067	Tamarack 7\WRP	Upland Waste Rock	General Grading	35,000	CY	$2	$70,000	$42,000	$0
BUR067	Tamarack 7\WRP	Upland Waste Rock	Upland Vegetation	14	AC	$5,000	$70,000	$42,000	$8,750
BUR098	Hercules No. 5	Upland Waste Rock	Bioengineering Steambanks	500	LF	$40	$20,000	$12,000	$6,000
BUR098	Hercules No. 5	Upland Waste Rock	General Grading	12,000	CY	$2	$24,000	$14,400	$0
BUR098	Hercules No. 5	Upland Waste Rock	Upland Vegetation	3	AC	$5,000	$15,000	$9,000	$1,875
BUR107	Ajax No. 3 \WRP	Upland Waste Rock	Bioengineering Steambanks	500	LF	$40	$20,000	$12,000	$6,000
BUR107	Ajax No. 3 \WRP	Upland Waste Rock	General Grading	12,000	CY	$2	$24,000	$14,400	$0
BUR107	Ajax No. 3 \WRP	Upland Waste Rock	Upland Vegetation	2.4	AC	$5,000	$12,000	$7,200	$1,500
BUR109	Oom Paul\WRP	Upland Waste Rock	Bioengineering Steambanks	300	LF	$40	$12,000	$7,200	$3,600
BUR109	Oom Paul\WRP	Upland Waste Rock	General Grading	5,000	CY	$2	$10,000	$6,000	$0

Table 12.2-5 (Continued)
Summary of Estimated Costs for Canyon Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Dump and Bank Stabilization (Continued)									
BUR109	Oom Paul\WRP	Upland Waste Rock	Upland Vegetation	1	AC	$5,000	$5,000	$3,000	$625
BUR114	West Star\WRP	Upland Waste Rock	Bioengineering Steambanks	300	LF	$40	$12,000	$7,200	$3,600
BUR114	West Star\WRP	Upland Waste Rock	General Grading	300	CY	$2	$600	$360	$0
BUR114	West Star\WRP	Upland Waste Rock	Upland Vegetation	1	AC	$5,000	$5,000	$3,000	$625
BUR124	Omaha\FP	Floodplain Sediments	Bioengineering Steambanks	1,770	LF	$40	$70,800	$42,480	$21,240
BUR124	Omaha\FP	Floodplain Sediments	General Grading	1,000	CY	$2	$2,000	$1,200	$0
BUR124	Omaha\FP	Floodplain Sediments	Upland Vegetation	0.6	AC	$5,000	$3,000	$1,800	$375
BUR128	Hecla Star	Upland Waste Rock	Bioengineering Steambanks	1,000	LF	$40	$40,000	$24,000	$12,000
BUR128	Hecla Star	Upland Waste Rock	General Grading	1,000	CY	$2	$2,000	$1,200	$0
BUR128	Hecla Star	Upland Waste Rock	Upland Vegetation	1	AC	$5,000	$5,000	$3,000	$625
BUR132	Gertie\WRP	Upland Waste Rock	Bioengineering Steambanks	300	LF	$40	$12,000	$7,200	$3,600
BUR132	Gertie\WRP	Upland Waste Rock	General Grading	8,000	CY	$2	$16,000	$9,600	$0
BUR144	Standard Mammoth\WRP	Upland Waste Rock	Bioengineering Steambanks	300	LF	$40	$12,000	$7,200	$3,600
BUR144	Standard Mammoth\WRP	Upland Waste Rock	General Grading	6,000	CY	$2	$12,000	$7,200	$0
BUR144	Standard Mammoth\WRP	Upland Waste Rock	Upland Vegetation	2.5	AC	$5,000	$12,500	$7,500	$1,563
BUR146	Gorge Gulch/FP	Floodplain Sediments	Bioengineering Steambanks	1,500	LF	$40	$60,000	$36,000	$18,000
BUR146	Gorge Gulch/FP	Floodplain Sediments	General Grading		CY	$2	$0	$0	$0
BUR146	Gorge Gulch/FP	Floodplain Sediments	Upland Vegetation	2	AC	$5,000	$10,000	$6,000	$1,250
WAL039	Strd Mammoth\FP	Floodplain Sediments	Bioengineering Steambanks	2,300	LF	$40	$92,000	$55,200	$27,600
WAL039	Strd Mammoth\FP	Floodplain Sediments	General Grading	1,000	CY	$2	$20,000	$12,000	$0
WAL039	Strd Mammoth\FP	Floodplain Sediments	Upland Vegetation	3	AC	$5,000	$15,000	$9,000	$1,875
								Capital	$ 1,160,000
								O&M	$ 140,000
								Total	$ 1,300,000

Table 12.2-5 (Continued)
Summary of Estimated Costs for Canyon Creek

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Treatment Pond									
	Canyon Creek Treatment Pond (60 cfs)		Reagent	6,411	TON	$600	$3,846,784	$2,308,071	$10,478,910
	Canyon Creek Treatment Pond (60 cfs)		Construction/Monitoring		LS	$5,511,929	$5,511,929	$3,307,157	$7,223,034
								Capital	$15,000,000
								O&M	$18,000,000
								Total	$33,000,000
							TOTAL CAPITAL COST		**$17,000,000**
							TOTAL O&M COST		**$18,000,000**
							TOTAL COST		**$35,000,000**

Table 12.2-6
Summary of Estimated Costs for South Fork

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
South Fork Human Health									
WAL037	Hercles	Upland Tailings	Excavation	12,000	CY	$3	$32,400	$19,440	$0
WAL03	Hercles	Upland Tailings	Local Repository Above Flood Level	12,000	CY	$10	$116,400	$69,840	$26,190
KLE062	USBM Imp.	Floodplain Sediments	Sediment Excavation	26,000	CY	$10	$260,000	$156,000	$0
KLE062	USBM Imp	Floodplain Sediments	Regional Repository	26,000	CY	$16	$416,000	$249,600	$104,000
KLE034	Silver Dollar	Floodplain Waste Rock	Excavation	4,400	CY	$2.70	$11,880	$7,128	$0
KLE034	Silver Dollar	Floodplain Waste Rock	Low Permeability Cap	2.29	AC	$151,000	$345,790	$207,474	$43,224
								Capital	$ 1,900,000
								O&M	$ 170,000
								Total	$ 2,070,000
South Fork Hot Spot									
WAL004		Floodplain Sediments	Excavate Sediments	17,000	CY	$10.00	$170,000	$102,000	$0
WAL004		Floodplain Sediments	Regional Repository	17,000	CY	$16.00	$272,000	$163,200	$68,000
WAL004		Floodplain Sediments	Hauling	34,000	CY-MI	$0.89	$30,260	$18,156	$0
OSB120		Floodplain Sediments	Excavate Sediments	33,000	CY	$10.00	$330,000	$198,000	$0
OSB120		Floodplain Sediments	Regional Repository	33,000	CY	$16.00	$528,000	$316,800	$132,000
OSB120		Floodplain Sediments	Hauling	66,000	CY-MI	$0.89	$58,740	$35,244	$0
OSB065		Floodplain Sediments	Excavate Sediments	42,000	CY	$10.00	$420,000	$252,000	$0
OSB065		Floodplain Sediments	Regional Repository	42,000	CY	$16.00	$672,000	$403,200	$168,000
OSB065		Floodplain Sediments	Hauling	84,000	CY-MI	$0.89	$74,760	$44,856	$0
KLE049		Floodplain Sediments	Excavate Sediments	10,000	CY	$10.00	$100,000	$60,000	$0
KLE049		Floodplain Sediments	Regional Repository	10,000	CY	$16.00	$160,000	$96,000	$40,000
KLE049		Floodplain Sediments	Hauling	20,000	CY-MI	$0.89	$17,800	$10,680	$0
								Capital	$ 4,500,000
								O&M	$ 410,000
								Total	$ 4,910,000

Table 12.2-6 (Continued)
Summary of Estimated Costs for South Fork

Source ID	Site Name	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Upper South Fork Human Health									
MUL002	Golconda	Upland Tailings	Excavation	23,000	CY	$2.70	$62,100	$37,260	$0
MUL002	Golconda	Upland Tailings	Local Repository Above Flood Level	23,000	CY	$9.70	$223,100	$133,860	$50,198
MUL001	Golconda	Floodplain Waste Rock	Excavation	75,360	CY	$2.70	$203,472	$122,083	$0
MUL001	Golconda	Floodplain Waste Rock	Local Repository Above Flood Level	75,360	CY	$9.70	$730,992	$438,595	$164,473
MUL019	Morning No. 6	Floodplain Tailings	Excavation	85,000	CY	$2.70	$229,500	$137,700	$0
MUL019	Morning No. 6	Floodplain Tailings	Local Repository Above Flood Level	85,000	CY	$9.70	$824,500	$494,700	$185,513
MUL019	Morning No. 6	Floodplain Waste Rock	Excavation	67,260	CY	$2.70	$181,602	$108,961	$0
MUL019	Morning No. 6	Floodplain Waste Rock	Low Permeability Cap	17.65	AC	$151,000	$2,665,150	$1,599,090	$333,144
MUL019	Morning No. 6	Adit Drainage	Permeable Reactive Trench	33.5	CY	$440	$14,740	$8,844	$88,441
MUL019	Morning No. 6	Adit Drainage	Adit Drainage Collection	1	LS	$6,200	$6,200	$3,720	$1,085
MUL019	Morning No. 6	Buildings & Structures	Decon Millsite	1	LS	$100,000	$100,000	$60,000	$5,000
MUL131	National Mill	Upland Tailings	Excavation	6,600	CY	$2.70	$17,820	$10,692	$0
MUL131	National Mill	Upland Tailings	Local Repository Above Flood Level	6,600	CY	$9.70	$64,020	$38,412	$14,405
MUL132	National Mill Adj. Tailings	Upland Tailings	Excavation	1,800	CY	$2.70	$4,860	$2,916	$0
MUL132	National Mill Adj. Tailings	Upland Tailings	Local Repository Above Flood Level	1,800	CY	$9.70	$17,460	$10,476	$3,929
								Capital	$ 8,600,000
								O&M	$ 850,000
								Total	$ 9,450,000
						TOTAL O&M COST			**$1,400,000**
						TOTAL CAPITAL COST			**$15,000,000**
						TOTAL COST			**$16,000,000**

Table 12.2-7
Summary of Estimated Costs for Lead in Floodplains

Site Name	Waste Type	TCD	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Lane Marsh (south of UPRR)	Wetland Pond	C01	Excavation	48,000	CY	$2.70	$129,600	$77,760	$0
Lane Marsh (south of UPRR)	Wetland Pond	HAUL-1	Haul 10 miles one-way	48,000	CY	$8.90	$427,200	$256,320	$0
Lane Marsh (south of UPRR)	Wetland Pond	C08	Regional Repository	48,000	CY	$10.31	$494,880	$296,928	$98,976
Lane Marsh (south of UPRR)	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Lane Marsh (south of UPRR)	General	LB-07a	Construct New Levee	14,000	LF	$151	$2,114,000	$1,268,400	$422,800
Lane Marsh (south of UPRR)	Wetland Sediment	LB-08	Place Sand Cap	340,000	CY	$8.02	$2,726,800	$1,636,080	$545,360
Medicine Lake	Wetland Pond	C01	Excavation	32,000	CY	$2.70	$86,400	$51,840	$0
Medicine Lake	Wetland Pond	HAUL-1	Haul 10 miles one-way	32,000	CY	$8.90	$284,800	$170,880	$0
Medicine Lake	Wetland Pond	C08	Regional Repository	32,000	CY	$10.31	$329,920	$197,952	$65,984
Medicine Lake	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Medicine Lake	General	LB-07a	Construct New Levee	9,000	LF	$151	$1,359,000	$815,400	$271,800
Medicine Lake	Wetland Sediment	LB-08	Place Sand Cap	320,000	CY	$8.02	$2,566,400	$1,539,840	$513,280
Medicine Lake	Lake Sediment	LB-04b	Dredge and Pipeline	110,000	CY	$7.59	$834,900	$500,940	$0
Medicine Lake	Lake Sediment	C08	Regional Repository	110,000	CY	$10.31	$1,134,100	$680,460	$226,820
Cave Lake	Wetland Pond	C01	Excavation	32,000	CY	$2.70	$86,400	$51,840	$0
Cave Lake	Wetland Pond	HAUL-1	Haul 10 miles one-way	32,000	CY	$8.90	$284,800	$170,880	$0
Cave Lake	Wetland Pond	C08	Regional Repository	32,000	CY	$10.31	$329,920	$197,952	$65,984
Cave Lake	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Cave Lake	General	LB-07a	Construct New Levee	14,000	LF	$151	$2,114,000	$1,268,400	$422,800
Cave Lake	Wetland Sediment	LB-08	Place Sand Cap	310,000	CY	$8.02	$2,486,200	$1,491,720	$497,240
Cave Lake	Lake Sediment	LB-04b	Dredge and Pipeline	180,000	CY	$7.59	$1,366,200	$819,20	$0
Cave Lake	Lake Sediment	C08	Regional Repository	180,000	CY	$10.31	$1,855,800	$1,113,480	$371,160
Bare Marsh	Wetland Pond	C01	Excavation	32,000	CY	$2.70	$86,400	$51,840	$0
Bare Marsh	Wetland Pond	HAUL-1	Haul 10 miles one-way	32,000	CY	$8.90	$284,800	$170,880	$0
Bare Marsh	Wetland Pond	C08	Regional Repository	32,000	CY	$10.31	$329,920	$197,952	$65,984

Table 12.2-7 (Continued)
Summary of Estimated Costs for Lead in Floodplains

Site Name	Waste Type	TCD	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Bare Marsh	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Bare Marsh	General	LB-07a	Construct New Levee	8,000	LF	$151	$1,208,000	$724,800	$241,600
Bare Marsh	Wetland Sediment	LB-08	Place Sand Cap	270,000	CY	$8.02	$2,165,400	$1,299,240	$433,080
Thompson Lake	Wetland Pond	C01	Excavation	48,000	CY	$2.70	$129,600	$77,760	$0
Thompson Lake	Wetland Pond	HAUL-1	Haul 10 miles one-way	48,000	CY	$8.90	$427,200	$256,320	$0
Thompson Lake	Wetland Pond	C08	Regional Repository	48,000	CY	$10.31	$494,880	$296,928	$98,976
Thompson Lake	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Thompson Lake	General	LB-07a	Construct New Levee	8,000	LF	$151	$1,208,000	$724,800	$241,600
Thompson Lake	Wetland Sediment	LB-08	Place Sand Cap	480,000	CY	$8.02	$3,849,600	$2,309,760	$769,920
Thompson Lake	Lake Sediment	LB-04b	Dredge and Pipeline	61,000	CY	$7.59	$462,990	$277,794	$0
Thompson Lake	Lake Sediment	C08	Regional Repository	61,000	CY	$10.31	$628,910	$377,346	$125,782
Thompson Marsh	Wetland Pond	C01	Excavation	16,000	CY	$2.70	$43,200	$25,920	$0
Thompson Marsh	Wetland Pond	HAUL-1	Haul 10 miles one-way	16,000	CY	$8.90	$142,400	$85,440	$0
Thompson Marsh	Wetland Pond	C08	Regional Repository	16,000	CY	$10.31	$164,960	$98,976	$32,992
Thompson Marsh	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Thompson Marsh	General	LB-07a	Construct New Levee	11,000	LF	$151	$1,661,000	$996,600	$332,200
Thompson Marsh	Wetland Sediment	LB-08	Place Sand Cap	95,000	CY	$8.02	$761,900	$457,140	$152,380
Thompson Marsh	Lake Sediment	LB-04b	Dredge and Pipeline	29,000	CY	$7.59	$220,110	$132,066	$0
Thompson Marsh	Lake Sediment	C08	Regional Repository	29,000	CY	$10.31	$298,990	$179,394	$59,798
Anderson Lake	Wetland Pond	C01	Excavation	16,000	CY	$2.70	$43,200	$25,920	$0
Anderson Lake	Wetland Pond	HAUL-1	Haul 10 miles one-way	16,000	CY	$8.90	$142,400	$85,440	$0
Anderson Lake	Wetland Pond	C08	Regional Repository	16,000	CY	$10.31	$164,960	$98,976	$32,992
Anderson Lake	Wetland Sediment	LB-06	Hydraulic Controls	3	EA	$57,200	$171,600	$102,960	$34,320
Anderson Lake	General	LB-07a	Construct New Levee	16,000	LF	$151	$2,416,000	$1,449,600	$483,200
Anderson Lake	Wetland Sediment	LB-08	Place Sand Cap	71,000	CY	$8.02	$569,420	$341,652	$113,884

Table 12.2-7 (Continued)
Summary of Estimated Costs for Lead in Floodplains

Site Name	Waste Type	TCD	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Anderson Lake	Lake Sediment	LB-04b	Dredge and Pipeline	120,000	CY	$7.59	$910,800	$546,480	$0
Anderson Lake	Lake Sediment	C08	Regional Repository	120,000	CY	$10.31	$1,237,200	$742,320	$247,440
Other (Ag-lands)	Wetland Sediment	N/A	Allowance for cleanup	6	LS	$1,000,000	$6,000,000	$0	$0
						TOTAL CAPITAL COST			**$74,000,000**
						TOTAL O&M COST			**$ 7,200,000**
						TOTAL COST			**$81,000,000**

Table 12.2-8
Summary of Estimated Costs for Particulate Lead in Surface Water

Source ID	Area	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Excavate CDR Banks	405,681	CY	$4.92	$1,995,951	$1,197,570	$0
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Haul 10 miles one-way	405,681	CY	$8.90	$3,610,561	$2,166,337	$0
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Regional Repository	405,681	CY	$10.36	$4,202,855	$2,521,713	$840,571
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Vegetative Bank Stabilization	89,383	LF	$36.00	$3,217,788	$1,930,673	$643,558
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Bank Stabilization via Revetments	87,000	LF	$83.00	$7,221,000	$4,332,600	$1,444,200
BNKWDG	Lower Coeur d'Alene River	Bank Wedge	Floodplain/Riparian Replanting	5,362,980	SF	$0.39	$2,091,562	$1,254,937	$418,312
								Capital	$36,000,000
								O&M	$ 3,300,000
								Total	$39,300,000
Splay Areas									
FPSED	Lower Coeur d'Alene River	Floodplain Sediments	Sediment Trap	4	EA	$270,020	$1,080,080	$648,048	$0
FPSED	Lower Coeur d'Alene River	Floodplain Sediments	Dredge & Pipeline	100,000	CY	$7.59	$759,000	$455,400	$0
FPSED	Lower Coeur d'Alene River	Floodplain Sediments	Regional Repository	100,000	CY	$10.36	$1,036,000	$621,600	$207,200
								Capital	$ 4,600,000
								O&M	$ 210,000
								Total	$ 4,810,000
Dredging									
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Dredge & Pipeline	500,000	CY	$7.59	$3,795,000	$2,277,000	$0
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Regional Repository	500,000	CY	$10.36	$5,180,000	$3,108,000	$1,036,000
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Dredge & Pipeline	200,000	CY	$7.59	$1,082,334	$649,400	$0
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Regional Repository	200,000	CY	$10.36	$1,477,336	$886,402	$295,467
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Dredge & Pipeline	200,000	CY	$7.59	$771,599	$462,960	$0
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Regional Repository	200,000	CY	$10.36	$1,053,198	$631,919	$210,640
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Dredge & Pipeline	200,000	CY	$7.59	550,123	$330,074	$0
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Regional Repository	200,000	CY	$10.36	$750,893	$450,536	$150,179

Table 12.2-8 (Continued)
Summary of Estimated Costs for Particulate Lead in Surface Water

Source ID	Area	Waste Type	Description	Quantity	Unit	Unit Direct Capital Cost	Direct Capital Cost	Indirect Capital Cost	Net Present Value of O&M
Dredging (Continued)									
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Dredge & Pipeline	200,000	CY	$7.59	$392,251	$235,351	$0
SED-BED	Lower Coeur d'Alene River near Dudley	Sediment Bed Load	Regional Repository	200,000	CY	$10.36	$535,405	$321,243	$107,081
		Note: 500,000 cy in year 0 and 200,000 cy in years 5, 10, 15, 20.						Capital	$25,000,000
								O&M	$ 1,800,000
								Total	$26,800,000
						TOTAL CAPITAL COST			**$66,000,000**
						TOTAL O&M COST			**$ 5,300,000**
						TOTAL COST			**$71,000,000**

Table 12.4-1
Summary of the Selected Remedy for the Spokane River

Area	Benchmark	Actions
Spokane River upstream of Upriver Dam	**Reduce human health and ecological exposures at selected shoreline sediment depositional areas.** Clean up sediment containing lead at concentrations greater than 700 mg/kg (sites with human health exposure). Clean up sediment resulting in unacceptable risks to ecological receptors (sites with ecological exposure). **Reduce concentrations of metals in surface water, moving toward achievement of AWQC** A reduction of dissolved metals loads of approximately 16% is estimated to result from implementation of the Selected Remedy. Additional load reductions would result from implementation of remedies in the Box. The estimated high flow reduction in particulate lead load needed is at least 50% to reduce year-round lead concentrations to below chronic AWQC in the Spokane River.	**Shoreline sites.** Use a combination of capping, removals, and performance monitoring. **Upriver Dam sediments.** Remediate contaminated sediments stored behind Upriver Dam and conduct performance monitoring. Remedial actions directed at surface water load reductions in the Basin to reduce metals transport. Key remedial actions expected to reduce metals entering the Spokane River include the implementation of a Coeur d'Alene Lake water quality protection program, lower Coeur d'Alene River bed and bank remediation, and South Fork of the Coeur d'Alene River groundwater remediation actions, particularly within the Box near Kellogg.
Estimated Total Present Worth Cost = $4,500,000 to $11,000,000		
Spokane River within reservation	**Reduce concentrations of metals in surface water, moving toward achievement of tribal water quality standards** **Quantify risks to tribal members practicing traditional subsistence lifestyles and to ecological receptors**	Remedial actions directed at surface water load reductions in the Basin to reduce metals transport (see Spokane River actions above). Perform Tribal-Specific Human Health Risk Assessment.
No remedial actions included within the reservation under the Selected Remedy		

Table 12.4-2
Summary of Estimated Cost Range for the Spokane River

Description	Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost[a]	O&M Cost (30 Yr. Present Worth)	Total Cost
UPPER RANGE ESTIMATE							
Shoreline Sites							
Access restrictions (gates)	ea	2	$2,000	$4,000	$2,400	$2,000	$8,400
Granular cap	ac	3.5	$58,080	$203,280	$121,968	$30,492	$355,740
Excavate	cy	8,380	$2.70	$22,626	$13,576	$0	$36,202
Backfill	cy	8,380	$18.00	$150,840	$90,504	$0	$241,344
Consolidate/cap on site	ac	2.0	$28,575	$57,150	$34,290	$8,572	$100,013
Disposal (Subtitle D)	cy	1,980	$36.40	$72,072	$0	$0	$72,072
Haul to landfill	cy-mi	59,400	$0.63	$37,125	$22,275	$0	$59,400
Revegetation	ac	1	$41,000	$41,000	$24,600	$0	$65,600
Bank stabilization	lf	400	$36.41	$14,564	$8,738	$4,369	$27,672
Upriver Dam							
Granular sediment cap	ac	17.0	$82,280.00	$1,398,760	$839,256	$419,628	$2,657,644
Monitoring							
Beach monitoring	ls	1	$0	$0	$0	$420,000	$420,000
Surface water monitoring	ls	1	$0	$0	$0	$470,000	$470,000
TOTAL LOWER RANGE COST ESTIMATE[b]				**$2,000,000**	**$1,200,000**	**$1,400,000**	**$4,500,000**
LOWER RANGE ESTIMATE							
Shoreline Sites							
Excavate	cy	28,000	$2.70	$75,600	$45,360	$0	$120,960
Backfill	cy	28,000	$18.00	$504,000	$302,400	$0	$806,400
Disposal (Subtitle D)	cy	28,000	$36.40	$1,019,200	$0	$0	$1,019,200
Haul to landfill	cy-mi	840,000	$0.63	$525,000	$315,000	$0	$840,000
Revegetation	ac	2	$41,000	$82,000	$49,200	$0	$131,200

Table 12.4-2 (Continued)
Summary of Estimated Cost Range for the Spokane River

Description	Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost[a]	O&M Cost (30 Yr. Present Worth)	Total Cost
Shoreline Sites (continued)							
Beach monitoring	ls	1	$0	$0	$0	$420,000	$420,000
Surface water monitoring	ls	1	$0	$0	$0	$470,000	$470,000
Upriver Dam							
Hydraulic dredge/pipeline/dewater	cy	82,000	$6.59	$540,380	$324,228	$0	$864,608
Disposal (Subtitle D)	cy	82,000	$36.40	$2,984,800	$0	$0	$2,984,800
Haul to landfill	cy-mi	2,460,000	$0.63	$1,537,500	$922,500	$0	$2,460,000
Monitoring	ls	1	$0.00	$0	$0	$400,000	$400,000
TOTAL UPPER RANGE COST ESTIMATE[b]				**$7,300,000**	**$2,000,000**	**$1,300,000**	**$11,000,000**

[a]Assumed at 60% of direct capital cost. No indirect costs assumed for disposal fee.
[b]Total costs rounded to two significant figures.

Notes:
ac - acre
cy - cubic yard
cy-mi - cubic yard-mile
lf - linear foot
ls - lump sum
O&M - operation and maintenance

13.0 STATUTORY DETERMINATIONS

This section describes how the Selected Remedy, which is an interim measure, satisfies the statutory requirements of CERCLA§121 (as required by NCP§300.430(f)(5)(ii)). This section also describes the five-year review requirements for the Selected Remedy. The following is an overview of the five statutory requirements.

- Protection of human health and the environment. This section describes how the Selected Remedy will adequately protect human health and the environment through treatment, engineering controls, and/or institutional controls (NCP§300.430(f)(5)(ii)(A)). Within its scope, the Selected Remedy protects human health and the environment from the exposure pathway or threat it is addressing and the waste material being managed.

- Compliance with ARARs specific to the Selected Remedy. This section describes the federal and state ARARs the Selected Remedy will attain. This section also describes the waiver invoked, if any, and the justification for invoking the waiver (NCP§§300.430(f)(5)(ii)(B) and (C)) for any ARARs the remedy will not attain. This section also describes other available information that does not constitute an ARAR (e.g., advisories, criteria, and guidance that are useful in selecting, designing, and implementing the remedy).

- Cost-effectiveness. This section describes how the Selected Remedy meets the Superfund program definition of a cost-effective remedy as one whose *"costs are proportional to its overall effectiveness"* (NCP§300.430(f)(1)(ii)(D)). The "overall effectiveness" of a remedy is determined by evaluating the following three of the five balancing criteria used in the detailed analysis of alternatives: 1) long-term effectiveness and permanence; 2) Reduction in toxicity, mobility, and volume through treatment; and 3) short-term effectiveness.

- Utilization of permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. This section describes the rationale for the remedy selected, explaining how the remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set out in NCP§300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanence and treatment can be practicably utilized at this site. The remedy selected is not designed or expected to be final, but represents the best balance of tradeoffs among alternatives with respect to pertinent criteria, given the limited scope of the action.

- Preference for treatment as a principal element. This section describes treatment components that support the statutory preference for treatment. The Selected Remedy satisfies the statutory preference because it contains treatment within its scope.

Within the scope of this remedial action, as is more specifically described in the remainder of this section, the Selected Remedy will: 1) provide an appropriate level of protectiveness of human health and the environment; 2) comply with federal and state requirements that are applicable or relevant and appropriate within its scope; 3) result in a cost-effective action; 4) utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable; and 5) satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

The remedial actions selected in this ROD are not intended to fully address contamination within the Basin. Thus, achieving certain water quality standards developed under the Clean Water Act and the Safe Drinking Water Act, such as water quality standards and MCLs, are outside of the scope of the remedial action selected in this ROD and are not applicable or relevant and appropriate at this time.[29] Similarly, special status species protection requirements under the MTBA and ESA are only applicable or relevant and appropriate as they apply to the remedial actions included within the scope of the Selected Remedy. Although these requirements are not ARARs throughout the Basin for this Selected Remedy, the priority cleanup actions included in the remedy were selected to progress towards the compliance with surface water quality standards and special status species protection requirements.

At present, the risks to persons, including Spokane tribal members, and others who may practice a subsistence lifestyle in the Spokane River have not been quantified. EPA and the Spokane Tribe are cooperating in planning additional testing and studies that will be implemented to evaluate the potential exposures to subsistence users. The results of those tests and studies will determine appropriate future response actions to be taken, if any.

The Selected Remedy is designed to provide remedial actions toward meeting the statutory requirement of protectiveness of human health and the environment (see 40 CFR 300.430(a)(i)(B) and 40 CFR 300.430 (f)(l)(ii)(c)(l)). Accordingly, such a remedy, by its nature, need not be as protective as the final remedy is required to be under CERCLA. Hence, the Selected Remedy is sufficiently protective in the context of its scope, even though it does not, by itself, meet the statutory protectiveness standard that a final remedy would have to meet. In

[29] The state water quality standards and some federal water quality criteria are applicable or relevant and appropriate to point source discharges to surface water created as a result of implementation of the Selected Remedy. Similarly, maximum contaminant levels are relevant and appropriate at residences where an alternate drinking water supply is provided or drinking water is treated.

addition, because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted at least every five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The Selected Remedy will adequately protect human health and the environment through treatment, engineering controls, and/or institutional controls (NCP§300.430(f)(5)(ii)(A)) within its scope, which includes:

- All of the remedy for protection of human health in the community and residential areas of the Upper Basin and Lower Basin, including identified recreational areas
- Approximately 30 years of prioritized actions for protection of the environment in the Upper Basin and Lower Basin
- All of the Spokane River human health remedy upstream of Upriver Dam and all of the environmental remedy from the Idaho/Washington border to Upriver Dam

13.1.1 Protection of Human Health in the Community and Residential Areas of the Upper Basin and the Lower Basin

The Selected Remedy will be protective of human health. The Selected Remedy will reduce exposure to lead in soil and house dust using a combination of vegetative barriers for soil lead concentrations between 700 mg/kg and 1,000 mg/kg and partial excavation and disposal for soil lead concentrations greater than 1,000 mg/kg such that there is a 5 percent or less probability of a typical child having a blood lead level of greater than 10 µg/dL and a 1 percent or less probability of a typical child having a blood lead level of greater than 15 µg/dL. Actions to reduce exposure to arsenic in soil, which is often co-located with lead, will result in a lifetime RME excess cancer risk for a residential exposure scenario within EPA's target range of to 10^{-6} to 10^{-4}.

The Selected Remedy will achieve compliance with drinking water standards established for protection of human health through a combination of hookups to public water supply systems, installation of new wells in uncontaminated aquifers, and point-of-use treatment. The Selected Remedy does not address potential future use of groundwater as a drinking water supply.

The Selected Remedy will reduce human exposure to lead and other metals in fish and other aquatic food sources. The degree of reduction achieved will depend on the extent individuals voluntarily reduce their consumption of affected food sources. In the long term, protection would be achieved through reductions in the levels of metals in whole fish and other aquatic food sources that would occur through implementation of the ecological cleanup actions over time.

The Selected Remedy for protection of human health in community and residential areas is not expected to fully protect traditional or modern subsistence lifestyles. In the long term, protection for subsistence lifestyles would be achieved through reductions in the levels of metals in surface water, sediment, and aquatic food sources that would occur through implementation of the ecological cleanup actions.

The Selected Remedy will not pose unacceptable short-term risks or cross-media impacts. There is some short-term risk to the community associated with materials hauling; however, these risks are acceptable in relation to the overall long and short-term risk reduction that would result from implementation of the remedy. No significant cross-media impacts are anticipated.

Certain potential exposures outside of the community and residential areas of the Upper Basin and Lower Basin are not addressed by this ROD, and will continue to present risks of human exposure to hazardous substances. These potential exposures impacting human health include:

- Recreational use at areas in the Upper Basin and Lower Basin where cleanup actions are not implemented pursuant to this ROD
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribes
- Potential future use of groundwater that is presently contaminated with metals

13.1.2 Protection of the Environment in the Upper Basin and Lower Basin

Within its scope, the Selected Remedy protects human health and the environment in the Upper Basin and Lower Basin from the exposure pathway or threat it is addressing and the waste material being managed.

The Selected Remedy for protection of the environment in the Upper Basin and Lower Basin will result in substantial reductions of exposures of humans and ecological receptors to metals in the areas the Selected Remedy addresses; however, full protection of human health and the environment would not be achieved by the Selected Remedy. The anticipated benefits of the Selected Remedy are listed below.

Risks to aquatic receptors will be reduced through surface and adit water treatment and engineering controls (removal and containment) to reduce metals loads and concentrations. A reduction of about 580 pounds per day of dissolved zinc from the Upper Basin and Lower Basin is anticipated. The dissolved metals reductions, combined with measures to clean up the effects of mining practices on riverine and riparian areas, are expected to result in an overall improvement in the fishery. Reaches that support adult fisheries will be connected with reaches capable of supporting spawning and rearing through migratory corridors to allow increased movement between the tributaries and the river. This would include re-establishment of fisheries in Ninemile Creek, improvements of spawning and rearing fisheries in Pine Creek, and improvements in the fisheries and water quality in the South Fork and Lower Basin.
Risks to waterfowl and other plants and animals in the Lower Basin floodplains would be reduced through sediment removals and capping in wetland and lake feeding areas. Approximately 2,669 acres of wetland feeding area and 1,859 acres of lake feeding area with sediment containing lead at concentrations exceeding 530 mg/kg, the LOAEL for waterfowl, would be cleaned up.[30] The potential for recontamination of these areas during future flood events would be limited through use of hydraulic controls, stabilization of contaminated sediment sources in the Upper Basin, stabilization of 33 miles of contaminated river banks in the Lower Basin, and limited removals of contaminated bed sediments from the lower Coeur d'Alene River.

Risks to riparian and riverine receptors would be reduced through cleanup of 33 miles of contaminated river bank and adjacent riparian zone in the Lower Basin and cleanup of the riverine and riparian zone in Upper Basin areas where cleanup is conducted.

Risks to recreational and subsistence users would be reduced through cleanup of contaminated metals at 33 miles of river bank in the Lower Basin and at recreational use areas of Lane Marsh, Medicine Lake, Cave Lake, Bare Marsh, Thompson Lake, Thompson Marsh, and Anderson Lake.

The risk of recontamination of Lower Basin floodplain areas and Spokane River shoreline areas would be reduced through removal and containment of many of the waste piles that are sediment sources, through bioengineering of unstable stream and bank sediments in the Upper Basin, through stabilization of 33 miles of erodable river bank in the Lower Basin, and through removal of 1.3 million cubic yards of contaminated bed sediments from the lower Coeur d'Alene River.

[30] The acres of lake area shown are the entire areas of the lakes. To develop estimated costs, it is anticipated contaminated sediments will be cleaned up to a water depth of six feet (an average of approximately 25% of the total lake area). These water depths represent the highest use feeding areas and, consequently, the areas of greatest exposure to waterfowl and other animals.

The Selected Remedy will not pose unacceptable short-term risks or cross-media impacts. Where the potential exists for unacceptable short-term risks or cross-media impacts, it will be mitigated using engineering controls. Actions included in the Selected Remedy are generally focused on unpopulated areas and use remedial actions that employ limited waste hauling, thereby minimizing the associated short-term risks to the community. Cross-media impacts would be limited to potential short-term increases in sediment levels in surface water resulting from soil or sediment removal actions conducted in or adjacent to streams or lakes. These sediment removals would be conducted in accordance with Clean Water Act requirements. These risks are acceptable in relation to the overall long and short-term risk reduction that would result from implementation of the remedy. The work will be sequenced to ensure that current land uses (e.g., recreational) will be available throughout the period of cleanup.

13.1.3 Spokane River

The Selected Remedy for the Spokane River will protect human health upstream of Upriver Dam and the environment from the Idaho/Washington border to Upriver Dam by reducing exposures to metals, principally lead, arsenic, and zinc, at shoreline sites used for recreation by humans and feeding by wildlife. The Selected Remedy will reduce exposure to lead at shoreline sites with lead concentrations exceeding 700 mg/kg using a combination of removals and capping such that there is a 5 percent or smaller probability of a typical child having a blood lead level exceeding 10 µg/dL and a 1 percent or smaller probability of a typical child having a blood lead level exceeding 15 µg/dL. These same actions would reduce the exposure to arsenic, which is co-located with lead.

The Selected Remedy for the Spokane River will reduce the exposure of waterfowl and other wildlife to sediment contaminated with lead and zinc through a combination of sediment removals and capping in critical habitat areas identified by the Washington Department of Ecology.

The Selected Remedy for the Spokane River will not pose unacceptable short-term risks or cross-media impacts. There is a marginal short-term risk to the community associated with materials hauling. Cross-media impacts would be limited to potential short-term increases in sediment levels in surface water resulting from soil or sediment removal actions conducted in or adjacent to the river. These sediment removals would be conducted in accordance with Clean Water Act requirements. These risks are acceptable in relation to the overall long and short-term risk reduction that would result from implementation of the remedy.

The long-term protectiveness of the remedy will be strongly influenced by remedial activities conducted in the Upper Basin and Lower Basin. These areas are the sources of the metals-impacted sediments that have been deposited within the Spokane River floodway in the past and are potential future sources of recontamination. These areas are also the primary sources of

metals in surface water in the Spokane River. Water quality standards for zinc are currently exceeded, and standards for lead are periodically exceeded. These conditions are expected to continue in the future unless sources in the Upper Basin and Lower Basin are remediated.

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The Selected Remedy will comply with those federal, state, and tribal requirements that are applicable or relevant and appropriate to the scope of the response action. Background information on these ARARs can be found in Parts 2 and 3 of the Final FS Report. No ARARs waivers are being invoked at this time.

ARARs for the remedy are discussed below under these categories:

- Waste Management and Repository Design
- Air Quality
- Surface Water Quality
- Drinking Water Quality
- Native American Concerns and Cultural Resources Protection
- Special Status Species
- Sensitive Environments
- Other Requirements

Guidance and other nonpromulgated materials to be considered (TBC) are described in the last subsection.

Waste Management and Repository Design

Idaho Solid Waste Management Rules regulations, IDAPA 58.01.05. Idaho regulations define the siting, design, operational, and closure requirements for solid waste management facilities. "Tier II" and "Tier III" facilities include landfills for non-municipal solid wastes, with Tier III facilities generally for management of solid wastes where leachate or gas may be formed. These regulations explicitly do not apply to "waste dumps, . . . tailings and other materials uniquely associated with mineral extraction, beneficiation or processing operation" and thus are not applicable. However, Tier II non-municipal solid waste landfill requirements are relevant and appropriate to the design, operation, and closure of mine waste repositories in the upper and lower Coeur d'Alene Basin. Sections of Tier III non-municipal solid waste landfill requirements may be relevant and appropriate to the design, operation, and closure of some repositories, including repositories that contain principal threat materials (e.g., metal concentrates). The

particular provisions of these regulations that are relevant and appropriate for discrete remedial actions will be identified through the remedial design process.

RCRA Subtitle C: Hazardous Waste Management, IDAPA 58.01.05. Pursuant to the RCRA Bevill Amendment, 42 USC§6921(b)(3)(A), solid wastes from the extraction, beneficiation, and some processing of ores and minerals are excluded from the RCRA Subtitle C requirements for managing hazardous wastes. In the Coeur d'Alene Basin, such excluded wastes include waste rock, mill tailings, and metal concentrates. However, elements of Subtitle C may be relevant and appropriate to ensure the safe management of some solid wastes, including principal threat materials (e.g., metal concentrates). RCRA Subtitle C elements that may be relevant and appropriate may include, for example, selected portions of the requirements for design and operation of a hazardous waste landfill, 40 CFR Part 264, Subpart N, IDAPA 58.01.05.009, and selected portions of the requirements for landfill closure and post-closure, 40 CFR Part 264, Subpart G, IDAPA 58.01.06.012-.013. For the management of RCRA hazardous wastes that are not Bevill-exempt, applicability of Subtitle C provisions depend on whether the wastes are managed within the Area of Contamination (AOC). 55 FR 8760 (Mar. 8, 1990). Applicable requirements of RCRA Subtitle C (or the state equivalent) may be satisfied by off-site disposal, consistent with the Off-Site Disposal Rule, 40 CFR 300.440. RCRA Subtitle C also provides treatment standards for debris contaminated with hazardous waste ("hazardous debris"), 40 CFR 268.45, IDAPA 58.01.05.011, although the lead agency may determine that such debris is no longer hazardous, consistent with 40 CFR 261.3(f)(2), IDAPA 52.01.05. These requirements will be applicable for debris contaminated with hazardous waste that will be managed outside the AOC. The particular provisions of Subtitle C that are applicable or relevant and appropriate for discrete remedial actions will be identified through the remedial design process.

RCRA Subtitle D: Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 CFR Part 257, Subpart A. These regulations are applicable for management and disposal of material generated by cleanup activity pursuant to the Selected Remedy in this ROD. Written for non-municipal non-hazardous waste disposal units, the regulations require that facilities in floodplains not restrict the flow of the base flood, nor reduce the temporary water storage capacity of the floodplain, nor result in washout of solid waste; and not cause or contribute to the taking of any endangered or threatened species. Facilities must not cause a discharge of pollutants into waters of the U.S. that violates the requirements of the National Pollutant Discharge Elimination System and must not contaminate an underground drinking water source beyond the solid waste boundary.

Idaho Land Remediation Rules, IDAPA 58.01.18.027. The Idaho Land Remediation Rules are only applicable to persons who wish to enter voluntary remediation agreements with the State of Idaho. However, EPA has concluded that the Institutional Controls provisions of these regulations are relevant and appropriate for managing waste in locations within the Basin where

metals concentrations remain above risk or regulatory levels after remediation. These provisions describe a range of institutional controls, including legal use restrictions, that may be available in certain situations.

Idaho Exploration and Surface Mining regulations, IDAPA 20.03.02. These regulations apply to "surface mining operations," as defined to mean the activities performed in an area where minerals are extracted from the ground. "Minerals" include clay, stone, sand, gravel, "and any other similar, solid material or substance of commercial value to be excavated from natural deposits on or in the earth." IDAPA 20.03.02.010. Substantive requirements of these regulations apply to borrow sources for soil, gravel, and similar clean materials for residential yards, landfill caps, and other areas requiring fill or barriers to underlying contamination. Provisions of IDAPA 20.03.02.140 are not mandatory, but may be relevant and appropriate to the placement and consolidation of contaminated material generated by cleanup activity pursuant to the Selected Remedy. Best management practices are listed for nonpoint source sediment control, clearing and grubbing, placement of topsoil conducive to the growth of vegetation, backfilling and grading, and erosion control.

Washington Hazardous Waste Management Act (Dangerous Waste) regulations, Ch. 173-303 WAC. These regulations are applicable to remedial actions in the State of Washington along the Spokane River. They provide requirements for the identification, accumulation, transport, treatment, and disposal of dangerous (including federally hazardous) wastes. (Note that the Bevill Exemption from RCRA Subtitle C requirements does not apply in the State of Washington.)

Washington Solid Waste Management Act regulations, Ch. 173-304 WAC. These regulations are applicable for the management and disposal of soils and sediments that are not State of Washington dangerous wastes and are excavated from Spokane River beaches within the State of Washington. They provide minimum functional standards for solid waste handling.

Air Quality

Clean Air Act regulations, *National Primary and Secondary Ambient Air Quality Standards (NAAQS)*, 40 CFR Part 50. These regulations are relevant and appropriate to soil removal operations which may generate fugitive emissions. NAAQS have been promulgated for fine and coarse particulates and for lead.

Idaho Rules for Control of Fugitive Dust, IDAPA 58.01.01.650-651. These regulations are applicable to soil removal operations which may generate fugitive emissions. They require that reasonable precautions be taken to prevent particulate matter from becoming airborne, including using water or chemicals to control dust, covering trucks for transporting materials, and promptly removing excavated materials.

Idaho Pollution Control regulations: Toxic Air Pollutants, IDAPA 58.01.01.585-586. These regulations provide screening emission levels and acceptable ambient concentrations (AAC) for designated noncarcinogens and for carcinogens including arsenic. If a remedial action under CERCLA causes an emission exceeding the ACC, Best Available Control Technology (BACT) must be applied until the emission level falls below the AAC. IDAPA 58.01.01.16. These regulations are applicable to elements of the Selected Remedy, such as soil removal, having the potential for creating excessive air emissions. Remedial actions will be carried out to minimize air emissions, and BACT will be applied if necessary to remain below acceptable ambient levels.

Washington Clean Air Act regulations, Ch. 173-400 WAC, Ch. 173-460 WAC. These regulations are relevant and appropriate to remedial activities that could generate fugitive dust containing metals. They require that discharges from treatment units must meet acceptable source impact levels (ASILs) at the property boundary. Generation of fugitive emissions is also regulated.

Surface Water Quality

Clean Water Act Storm Water Multi-Sector General Permit for Industrial Activities. 65 FR 64746-64880 and 40 CFR 122.26. These regulations provide that discharges of storm water associated with "industrial activities" require an NPDES permit. "Industrial activities" include inactive mining facilities, hazardous waste treatment units, and RCRA Subtitle D landfills. The substantive requirements of the Storm Water Multi-Sector General Permit for Industrial Activities (Oct. 30, 2000) apply to elements of the Selected Remedy that result in discharges of storm water, including constructing and operating mine waste repositories. Best management practices (BMPs) must be used, and appropriate monitoring performed, to ensure that storm water runoff does not exceed state water quality standards. It is not an ARAR for seepage or mine drainage.

Clean Water Act Section 304—Federal Ambient Water Quality, 66 FR 18935-18936 (April 12, 2001). Section 304(a)(1) of the Clean Water Act requires EPA to develop, publish, and revise criteria for water quality accurately reflecting the latest scientific knowledge. CERCLA Section 121(d)(2)(B)(i) provides that, "In determining whether or not any water quality criteria under the Clean Water Act is relevant and appropriate under the circumstances of the release or threatened release, the President shall consider the designated or potential use of the surface or groundwater, the environmental media affected, the purposes for which such criteria were developed, and the latest information available." On April 12, 2001, EPA notified the public of revised Ambient Water Quality Aquatic Life Criteria for cadmium. These revised criteria are relevant and appropriate to point source discharges to surface water, where those point sources are established as part of the selected remedial action. These values are relevant and appropriate for the Selected Remedy because they represent the latest scientific knowledge, as determined by EPA's

Health and Ecological Criteria Division, Office of Science and Technology. They are also relevant and appropriate for the Selected Remedy because these criteria were developed to better protect aquatic organisms such as bull trout, a threatened species, that may be found within the Coeur d'Alene Basin. The Selected Remedy will satisfy this ARAR by ensuring that point source discharges established by the remedy do not cause exceedances of the Water Quality Criteria for cadmium in receiving surface waters.

Idaho Water Quality Standards and Wastewater Treatment Requirements, IDAPA 58.01.02. The Idaho water quality standards (WQS) that were submitted to EPA prior to May 30, 2000, and any changes adopted by Idaho and approved by EPA between May 30, 2000 and the date of this ROD are applicable to point source discharges to Idaho surface water, where those point sources are established as part of the selected remedial action. Except as noted above concerning federal AWQC for cadmium, WQS that have been adopted by Idaho but not yet submitted to or approved by EPA, and are more stringent than the standards submitted to EPA prior to May 30, 2000, if any, are relevant and appropriate to point source discharges to Idaho surface water, where those point sources are established as part of the selected remedial action. Idaho WQS for protection of human health and aquatic life incorporate the National Toxics Rule (40 CFR 131.36) by reference for waters designated for aquatic life, recreation, and domestic water supply (Section 210). Turbidity standards for protection of aquatic life (cold water biota) are also applicable (Section 250). Variances can be granted for individual pollutants if the standard is unattainable, based on the criteria in the rule (Section 260). Short-term exemptions allow exceedances of the water quality standards under certain circumstances that are identified in the regulation (e.g., dredge and fill activities) (Section 080). Where Idaho WQS are applicable or relevant and appropriate to the Selected Remedy, point source discharges established by the remedy, such as those from a water treatment plant, must not cause exceedances of WQS in the receiving water body.

Idaho Stream Channel Alteration regulations*,* IDAPA 37.03.07. These regulations are applicable to any alteration of stream channels. "Alteration" means to change the natural shape of a stream channel, including by removing or placing any material or structures with potential to affect the flow within the channel. The substantive requirements of these regulations are applicable to elements of the Selected Remedy, such as streambank stabilization, with potential to affect stream flows in the upper and lower basins. Substantive requirements include standards for placement of rock riprap and for construction of cofferdams and temporary stream crossings.

Clean Water Act, Section 404—Dredge or Fill Requirements, 33 USC§1344, 33 CFR Parts 320-330; 40 CFR Part 230. These requirements are applicable to work in or near navigable waters. They establish requirements that limit the discharge of dredged or fill material into navigable waters and associated wetlands. EPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of

toxic effluent standards, and jeopardy of threatened or endangered species. Special consideration is required for "special aquatic sites," which are defined to include wetlands.

Washington Water Quality Standards, Ch. WAC 173-201A. Washington's toxics standards for protection of aquatic life (Section 070), as submitted to EPA by May 30, 2000, and any changes adopted by Washington and approved by EPA between May 30, 2000 and the date of this ROD are applicable to point source discharges to surface water in Washington State (with the exception of tribal lands). These regulations are applicable to the Selected Remedy to the extent the Selected Remedy results in a point source discharge to surface water in Washington State. The Washington State regulations for human health protection incorporate the National Toxics Rule (40 CFR 131.36) by reference. The regulations also provide for short-term modifications of standards for specific water bodies during the performance of essential activities or to otherwise protect the public interest (Section 110). For example, the turbidity criteria established under Section 030 of the regulation can be modified to allow a temporary mixing zone during and immediately after in-water or shoreline construction activities that may result in the disturbance of in-situ sediments.

Washington Hydraulics Project Approval regulations, Ch. 220-110 WAC. Substantive requirements of these regulations are applicable to remedial actions along and within the Spokane River that could affect fish life. They provide actions required for riverbank protection, temporary culvert construction, and dredging, for example.

Drinking Water Quality

Idaho Drinking Water Regulations, IDAPA 58.01.08.050; *Safe Drinking Water Act, National Primary Drinking Water* regulations, 42 USC§300f, 40 CFR Part 141. These regulations are applicable to all public drinking water systems supplying residents of the Coeur d'Alene Basin and are relevant and appropriate to the provision of alternate water supplies, including the installation of new groundwater wells or treatment at the tap. The regulations require that contaminant concentrations in drinking water remain below MCLs and non-zero MCL goals (MCLGs). By final rule effective February 22, 2002, EPA lowered the MCL for arsenic from 0.05 mg/L to 0.01 mg/L (66 FR 7061). While community water systems have until January 2006 to comply with the new MCL for arsenic, EPA has determined that the new MCL is relevant and appropriate presently for ensuring that drinking water as provided by the Selected Remedy is protective of human health.

Native American Concerns and Cultural Resources Protection

Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC§3001 et seq. 43 CFR Part 10. NAGPRA and implementing regulations are intended to protect Native American graves from desecration through the removal and trafficking of human remains and

"cultural items" including funerary and sacred objects. To protect Native American burials and cultural items, the regulations require that if such items are inadvertently discovered during excavation, the excavation must cease and the affiliated tribes must be notified and consulted. This program is applicable to ground-disturbing activities such as soil grading and removal.

American Indian Religious Freedom Act, 42 USC§1996 et seq. This statute is applicable to soil excavation in areas of the Coeur d'Alene Basin. It protects religious, ceremonial, and burial sites and the free practice of religions by Native American groups. If sacred sites are discovered in the course of soil disturbances, work will be stopped and the Coeur d'Alene and/or Spokane Tribes will be contacted. The statute has no implementing regulations; following the NAGPRA process should meet with the intent of the law.

National Historic Preservation Act (NHPA), 16 USC§470f, 36 CFR Parts 60, 63, and 800. The NHPA and implementing regulations require agencies to consider the possible effects on historic sites or structures of actions proposed for federal funding or approval. Historic sites or structures are those included on or eligible for the National Register of Historic Places, generally older than 50 years. If an agency finds a potential adverse effect on historic sites or structures, such agency must evaluate alternatives to "avoid, minimize, or mitigate" the impact, in consultation with the State Historic Preservation Office (SHPO). The NHPA and implementing regulations are applicable to selected remedial activities such as mill building, demolition, and soil excavation which could disturb historical sites or structures. In consultation with the SHPO, unavoidable impacts on historic sites or structures may be mitigated through such means as taking photographs and collecting historical records.

Archaeological Resources Protection Act (ARPA), 16 USC§470aa et seq., 43 CFR Part 7. ARPA and implementing regulations prohibit the unauthorized disturbance of archaeological resources on public and Indian lands. Archaeological resources are "any material remains of past human life and activities which are of archaeological interest," including pottery, baskets, tools, and human skeletal remains. The unauthorized removal of archaeological resources from public or Indian lands is prohibited without a permit, and any archaeological investigations at a site must be conducted by a professional archaeologist. ARPA and implementing regulations are applicable for the conduct of any selected remedial actions that may result in ground disturbance.

Special Status Species

Endangered Species Act (ESA), 16 USC 1531 et seq., 50 CFR Parts 17, 402. The ESA and implementing regulations make it unlawful to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any federally-designated threatened or endangered species. The ESA and implementing regulations are applicable to activities of the Selected Remedy (for example, soil removal or repository construction) that could affect federally-designated threatened or endangered species that may be present within the Coeur d'Alene Basin. Such species may

include bull trout, bald eagle, lynx, and gray wolf. Consistent with ESA Section 7, if any federally designated threatened or endangered species are identified in the vicinity of remediation work, EPA will consult with the U.S. Fish and Wildlife Service to ensure that remedial actions are conducted in a manner to avoid adverse habitat modification and jeopardy to the continued existence of such species.

Migratory Bird Treaty Act (MBTA), 16 USC 703 et seq. The MBTA makes it unlawful to "hunt, take, capture, kill" or take various other actions adversely affecting a broad range of migratory birds, including tundra swans, hawks, falcons, songbirds, without prior approval by the USFWS. (See 50 CFR 10.13 for the list of birds protected under the MBTA.) Under the MBTA, permits may be issued for take (e.g., for research) or killing of migratory birds (e.g., hunting licenses). The mortality of migratory birds due to ingestion of contaminated sediment is not a permitted take under the MBTA. The MBTA and its implementing regulations are relevant and appropriate for protecting migratory bird species identified within the Coeur d'Alene Basin. The Coeur d'Alene Basin is located within the Pacific migratory flyway and provides important habitat for migratory waterfowl. The selected remedies will be carried out in a manner that avoids the taking or killing of protected migratory bird species, including individual birds or their nests or eggs.

Idaho Classification and Protection of Wildlife regulations, IDAPA 13.01.06. These regulations are relevant and appropriate to remedial activities that could affect wildlife species protected by the State of Idaho, including species listed by state regulation as endangered, threatened, species of special concern, and protected nongame species.

Washington Game Code, Ch. WAC 232-12. These regulations are relevant and appropriate to beach cleanup activities and provide a list of state endangered, threatened, sensitive, and other protected species.

Sensitive Areas

Rivers and Harbors Act, Section 10 regulations, 33 CFR Parts 320 through 330. These regulations are applicable to activities in or near navigable waters. They prohibit unauthorized obstruction or alteration of navigable waters.

Protection of Wetlands, Executive Order 11990; 40 CFR 6.302(a); 40 CFR Part 6, Appendix A. This executive order and regulations apply to remedial activities in wetlands. They require federal agencies to avoid adversely impacting wetlands, minimize wetland destruction, and preserve the value of wetlands.

Protection of Floodplains, Executive Order 11988, 40 CFR 6.302(b) and Appendix A. This executive order and implementing regulations are applicable to the remedial actions within the floodplain of the Coeur d'Alene River and its tributaries. Federal agencies are required to evaluate the potential effects of actions that take place in floodplains and to avoid adverse impacts.

Idaho Lakes Protection Act regulations, IDAPA 20.03.04. These regulations are applicable to remedial work within the beds or waters of navigable lakes of the State of Idaho. They require that the protection of property, navigation, fish and wildlife habitat, aquatic life, recreation, aesthetic beauty and water quality be given due consideration.

Washington Shoreline Management Act and regulations, Ch. 90.58 RCW; Ch.173-18, Ch. 173-22, and Ch.173-27 WAC. This program is applicable to activities within 200 feet of a shoreline of the State of Washington. Applicable activities should be conducted to protect the natural character of the streamway. Shoreline protection measures (such as riprap) should be located, designed, and constructed to avoid the need for channelization of a stream flow, consistent with substantive provisions of the regulations.

Other Requirements

Hazardous Materials Transportation Act regulations, 49 CFR Parts 171-180. These regulations apply to the movement of contaminated soils along public highways and require packaging, documentation, and placarding appropriate to the materials being transported.

Washington Model Toxics Control Act regulations, Ch. 173-340 WAC. These regulations are applicable to the remediation of beach sites between the State line and the Upriver dam. They set soil remediation levels for protection of human health and the environment.

To Be Considered (TBC)

Responsibilities of Federal Agencies to Protect Migratory Birds, Executive Order 13186 (66 FR 3853, Jan. 17, 2001). This executive order encourages federal agencies to integrate migratory bird conservation principles into agency plans and activities. Such efforts may include preventing or abating pollution for the benefit of migratory birds or restoring or designing migratory bird habitat. Substantive elements of this executive order are TBCs for the implementation of the selected remedial actions.

Centers for Disease Control and Prevention (CDC) Statement on Preventing Lead Poisoning in Young Children, 1991. This statement is a TBC providing an intervention level of 10 µg/dL blood lead concentration.

EPA Strategy for Reducing Lead Exposures, 1991. This strategy is a TBC for reducing the amount of lead introduced into the environment and for significantly reducing the blood lead level incidence above 10 μg/dL in children.

Revised Interim Lead Guidance for CERCLA Sites, EPA OSWER Directive 9355.4-12, 1994. This guidance is a TBC that recommends a 400 ppm lead screening level and describes how to develop site-specific remediation goals and a management strategy for lead contamination at sites with multiple lead sources. OSWER Directive 9200.4-27P was issued in 1998 to clarify the 1994 policy of OSWER Directive 9355.4-12.

Integrated Exposure Uptake Biokinetic Model (IEUBK) for Lead in Children, PB 93 9635121.7-15-2. This model was used to develop the 400 ppm lead screening level in OSWER Directive 9355.4-12.

Design and Construction of RCRA/CERCLA Final Covers, EPA/625/4-91/025, May 1991. This publication provides guidelines for the design and construction of these covers.
Guidelines for Mine Tailings Repositories Coeur d'Alene Basin Restoration Project, April 27, 1995. This TBC provides guidelines for location, design, construction, and management of a mine waste repository.

Best Management Practices for Soils Treatment Technologies (EPA OSWER, 1997). This TBC provides technologies for controlling cross-media transfer of contaminants during materials handling activities.

Mine and Mill Waste Remedial Guidelines and Best Management Practices (CDA Basin Restoration Project). Under this TBC, design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish, and wildlife habitat, while minimizing potential for human exposure.

Considering Wetlands at CERCLA Sites, EPA OSWER 9280.03, 1994. This guidance is a TBC that discusses the consideration of potential impacts of response actions on wetlands at CERCLA sites.

Idaho Non-Point Source Management Plan, 1999. This plan is a TBC for remedial activities that disturb soils and sediments. The plan requires activities to be consistent with the state's goal of restoration, maintenance, and protection of the beneficial uses of both surface water and groundwater. Long-term goals include design and implementation of BMPs for surface water and groundwater.

13.3 COST-EFFECTIVENESS

In EPA's judgment, the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The overall effectiveness of this remedy was determined to be proportional to its costs and hence the remedy is cost-effective.

To the extent that the costs of the alternatives that comprise the Selected Remedy exceed the costs of other alternatives, the additional cost is proportional to the additional benefits in long-term effectiveness and permanence, reduction in toxicity, mobility, and volume through treatment, and short-term effectiveness.

Long-Term Effectiveness and Permanence. Within its limited scope, the Selected Remedy will achieve overall effectiveness with respect to long-term effectiveness and permanence. The Selected Remedy for protection of human health in the community and residential areas of the Upper Basin and Lower Basin will achieve long-term effectiveness and permanence by reducing residual risks resulting from exposure to lead in soil, house dust, drinking water, and aquatic food sources to acceptable levels. An institutional controls program and follow-up health services would be used to maintain remedy effectiveness over time.

The Selected Remedy for protection of the environment will achieve substantial reductions in residual risks to aquatic receptors resulting from metals in surface water and to waterfowl and other animals resulting from metals in wetland and lateral lake sediments. Overall, the Selected Remedy would be expected to achieve about 50 to 70 percent of the dissolved metals load reduction in the Upper Basin that would be anticipated from full implementation of Ecological Alternative 3 for about 19 percent of the estimated cost of Ecological Alternative 3. The long-term effectiveness and permanence would be enhanced through measures to limit the release of contaminated sediments to surface water that could recontaminate remediated areas.

The Selected Remedy for the Spokane River upstream of the Spokane Indian Reservation will achieve overall effectiveness with respect to long-term effectiveness and permanence. A combination of removals and capping will result in low residual risks. Removals will be used at sites where maintaining the long-term integrity of capping would be difficult. The potential

exists for some recontamination of sites from upstream sources. Recontamination would be addressed through monitoring and periodic maintenance.

Reduction in Toxicity, Mobility, or Volume Through Treatment. The Selected Remedy will achieve overall effectiveness with respect to reduction in toxicity, mobility, or volume through treatment. The Selected Remedy includes treatment to reduce the toxicity of drinking water and surface water and, should amendments to limit the bioavailability of metals prove feasible, treatment to reduce the toxicity of soil and sediment.

Short-Term Effectiveness. Within its limited scope, the Selected Remedy will achieve overall effectiveness with respect to short-term effectiveness. Implementation of the Selected Remedy for protection of human health in the community and residential areas of the Upper Basin and Lower Basin is a top priority, and the Selected Remedy will achieve human health RAOs within a relatively short time after completion of the remedial actions.

The Selected Remedy for protection of the environment will provide short-term effectiveness through prioritizing actions and focusing environmental emphasis on the more serious problems, including dissolved metals in rivers and streams, lead in floodplain soil and sediment, and particulate lead in surface water, while limiting adverse impacts on the communities and ecosystems. Examples of the problems the high priority actions will target include the most highly erodable banks, wetlands with high waterfowl mortality, highly contaminated river bed sediments in natural sediment deposition areas, and water with very high loads of dissolved metals in Canyon Creek, where source-by-source removal and containment actions would be costly and take a long time to implement. As construction is completed at individual sites, RAOs for those soils, sediments, and source materials addressed by the Selected Remedy would be achieved. Short-term impacts to the communities will be limited through generally focusing actions in unpopulated areas and through use of remedial actions that employ limited waste hauling.

The Selected Remedy for the Spokane River upstream of the Spokane Indian Reservation will achieve overall effectiveness with respect to short-term effectiveness. RAOs at shoreline and depositional areas would be achieved immediately after implementation of the remedy. Potential short-term impacts to the community from material hauling and to the ecosystem from release of contaminated sediments during construction will be limited.

13.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of tradeoffs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site disposal without treatment and considering State and community acceptance. EPA's balancing criteria in selecting a remedy include: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility, or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost.

Engineering controls employed in the Selected Remedy, including removal and containment, are appropriate for metals-contaminated soil, sediments, and house dust because these materials can be reliably controlled in place. These engineering controls provide for long-term effectiveness and permanence, achieve short-term effectiveness, and are implementable. As described in Section 13.3, the overall effectiveness of the Selected Remedy was determined to be proportional to its costs and hence the Selected Remedy is cost effective. As described in Section 13.5, the Selected Remedy achieves the statutory preference for treatment as a principal element.

Initially, surface water treatment in Canyon Creek provides a better balance of tradeoffs than more permanent removal and containment actions. Although surface water treatment would not result in ecological improvements within Canyon Creek, it provides a better balance of tradeoffs with respect to short-term effectiveness for the river system as a whole because:

- it can be implemented more rapidly than the comprehensive scope of removal and containment actions that would be required to achieve an equivalent metals load reduction
- it would result in fewer short-term impacts to the community from excavation, hauling, and repositories of contaminated materials
- it would result in fewer short-term impacts to the environment from release of contaminated sediment to surface water during construction

Surface-water treatment is also potentially much less costly than comprehensive removal and treatment actions and achieves a reduction of toxicity through treatment. Surface-water treatment will not result in achieving AWQC within Canyon Creek. Further characterization and source-by-source cleanup would be required to achieve this goal.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR 300.430(a)(1)(iii)(A)). EPA has also established an expectation for use of engineering controls, such as containment, for waste that poses a relatively low, long-term threat or where treatment is impracticable (40 CFR 300.430(a)(1)(iii)(B)). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. Engineering controls employed in the Selected Remedy, including removal and containment, are appropriate for metals-contaminated soil, sediments, and house dust because these materials can be reliably controlled in place.

Although the Selected Remedy is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, the Selected Remedy does utilize treatment, and thus supports that statutory mandate. A comprehensive evaluation for preference for treatment will be conducted in subsequent decision documents. Treatment of surface water to reduce toxicity is included in the Selected Remedy for the Upper Basin, as described in Section 12.2. Treatment of drinking water at private wells is included in the Selected Remedy, as described in Section 12.1. Treatment using amendments to reduce the toxicity of soil and sediment will be evaluated as part of remedial design.

13.6 FIVE-YEAR REVIEW REQUIREMENTS

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted at least every five years after initiation of remedial action to ensure that the Selected Remedy is, or will be, protective of human health and the environment.

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Selected Remedy contains limited significant changes from the Preferred Alternative identified in the Proposed Plan.

- The fisheries benchmark for the reach of Ninemile Creek identified as "mainstem from East Fork confluence to 0.75 mile downstream of Blackcloud Creek" has been changed from a Tier 2 fishery to a Tier 1 fishery. No changes were made to the cleanup actions included in the Selected Remedy for Ninemile Creek.

- Cleanup of the Nabob Mine site in the East Fork of Pine Creek watershed has been added to the Selected Remedy.

- The Coeur d'Alene Millsite has been cleaned up and has been deleted from the Selected Remedy.

- The estimate of dissolved zinc load reduction in the Coeur d'Alene River at Harrison has been revised from 660 pounds per day to 580 pounds per day, based primarily on revisions to the projected effectiveness of passive treatment in Canyon Creek.

- State legislation under the Basin Environmental Improvement Act established the process for the formation of the Basin Environmental Improvement Project Commission. This commission includes federal, state, tribal, and local governmental involvement. EPA anticipates working as a member of the commission for implementation of the ROD and development of priorities and sequencing of cleanup activities.

It is EPA's intent to increase the removal of riverbed sediments in the Dudley reach of the Coeur d'Alene River from 1.3 million cubic yards to up to 2.6 million cubic yards if the pilot removal project is demonstrated to be compliant with ARARs and cost-effective. This would increase the sediment removal from 6 percent of contaminated riverbed sediments to approximately 12 percent of the total contaminated sediments. The increased volume is intended to further reduce downstream particulate lead movement during high flow events. This change will make additional progress toward reducing potential recontamination and compliance with ARARs in the Spokane River in the State of Washington. Based on current unit cost estimates, the cost of this additional riverbed sediment removal is estimated at $26 million. This change is reflected in Table 12.2-1, but the description of the Selected Remedy in the remaining sections of the ROD has not been changed.

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